

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae)

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Synopsis

The species of the genus *Meteorus* from the western Palaearctic zoogeographical region are revised, keyed and illustrated. Thirty-six of the 121 nominal species discussed are considered to be valid and 3 are new. Seventy-one names are placed in synonymy, 44 for the first time. Seventy-seven primary types have been examined and of these 35 lectotypes are herein designated. Fourteen species are considered nomina dubia. About 3500 specimens have been examined.

Introduction

The taxonomy of the parasitic Hymenoptera is the least known of any large group of insects and, until recent years, the Braconidae have received even less attention than most other groups of Parasitica. There is therefore a pressing need for revisionary work in most parts of the family. Moreover this is no mere academic exercise; many species of Braconidae use as hosts insects which are important economically as pests of crops. The need for programmed 'biological' control is already becoming more urgent as the effectiveness of chemical methods of pest control declines. The use of parasitoid insects in the control of pest species has so far met with only sporadic success. For biological control to be effective an intimate knowledge of the biology of the insects involved is essential and this in turn is founded upon an accurate knowledge of their taxonomy. This paper is concerned with the taxonomy of the western Palaearctic species of *Meteorus*, all of which appear to be primary parasites of the larvae of either Lepidoptera or Coleoptera.

It was originally intended to include in this revision the species of the whole of the Palaearctic region. No material was available for study from the U.S.S.R. or from China, however, nor was type-material available of the species described from the U.S.S.R. (*M. baicalensis* Telenga, *M. flagellatus* Alexeev, *M. politutele* Shenefelt [replacement name for *politus* Telenga, not Provancher], *M. postelowi* Telenga). These areas have therefore been omitted from consideration.

All other areas of the Palaearctic region have been included but the bulk of the material available for study came from NW. Europe.

Depositories

MNHU, Berlin	Museum für Naturkunde der Humboldt-Universität, Berlin.
NMB, Berne	Naturhistorisches Museum Bern, Berne.
IRSNB, Brussels	Institut Royal des Sciences Naturelles de Belgique, Brussels.
HNHM, Budapest	Hungarian Natural History Museum, Budapest.
NMI, Dublin	National Museum of Ireland, Dublin.
IP, Eberswalde	Institut für Pflanzenschutzforschung, Eberswalde.
RNH, Leiden	Rijksmuseum van Natuurlijke Historie, Leiden.
BMNH	British Museum (Natural History), London.
ZI, Lund	Zoologiska Institutionen, Lund.
NMV, Melbourne	National Museum of Victoria, Melbourne.
ZSBS, Munich	Zoologische Sammlung des Bayerischen Staates, Munich.
EH, Munich	E. Haeselbarth collection, Munich.
MZ, Naples	Museo Zoologia, Naples.
CNC, Ottawa	Canadian National Collection, Biosystematics Research Institute, Ottawa.
UM, Oxford	University Museum, Oxford.
MNH, Paris	Muséum National d'Histoire Naturelle, Paris.
ZC, Plovdiv	A. Zaykov collection, Plovdiv.
MSC, Reading	M.R. Shaw collection, Reading.
USDA, Sèvres	USDA, European Parasite Laboratory, Sèvres.
NR, Stockholm	Naturhistoriska Riksmuseet, Stockholm.
HC, Stockholm	K.-J. Hedqvist collection, Stockholm.
MZS, Turin	Museo ed Istituto di Zoologia Sistemática, Università di Torino, Turin.
UDE, Uppsala	University Department of Entomology, Uppsala.
NM, Vienna	Naturhistorisches Museum, Vienna.
IFF, Vienna	Institut für Forstentomologie und Forstschutz, Vienna.
AU, Wageningen	Agricultural University, Wageningen.
USNM, Washington	[U.S. National Museum] National Museum of Natural History, Washington, D.C.
NIAS, Yatabe	Plant Disease Herbarium and Insect Museum, National Institute of Agricultural Sciences, Yatabe.

Taxonomic history

Meteorus Haliday (1835: 24) was first used as a subgenus of *Perilitus* Nees von Esenbeck, as it was then defined, to accommodate those species having three submarginal (cubital) cells in the forewing. Haliday dealt with 17 species of *Meteorus* of which only the 13 comprising his 'section B' are now considered to belong in *Meteorus* s.str.; the remainder are placed in the genus *Zele* Curtis [*Zemiotetes* Foerster]. In section B, Haliday described seven species as new to science. Haliday's collection is now housed in the NMI, Dublin where A. W. Stelfox in 1948 collated the *Meteorus* and transferred them to their present cabinet from the boxes in which Haliday had left them. Stelfox, in his unpublished notes on the collection, stated 'no specimen bears the name of one of his [Haliday's] own species, though several carry his Ms labels with Wesmael's names; also two have his Ms labels bearing "nomina nuda" or possibly "pet names" which are nowhere referred to in his Ms lists. He has therefore left us no "types"!'. Furthermore, the four species which were least adequately described (*delator*, *jaculator*, *profligator* and *vexator*) are no longer present in the collection; the interpretation of these species must therefore rest entirely upon their descriptions.

Nees von Esenbeck (1811) described five species of 'Bracon' which he later transferred to section II of his genus *Perilitus* (corresponding to *Meteorus* s.l.), adding descriptions of four more species. Nees' collection was destroyed during the 1939–45 war (Griffiths, 1964: 829) and there is therefore no original material of his species. In most cases, however, there are long-established and generally accepted usages of Nees' names and the identification of his species causes but little difficulty. It has not therefore been considered necessary to designate neotypes.

Wesmael (1835) described 16 species of *Meteorus* in the genus *Perilitus*. Wesmael's collection is well-preserved in Brussels and the identity of the species he described can therefore be established beyond doubt. Some slight difficulty arises in distinguishing valid syntype specimens from amongst Wesmael's material because the number of specimens labelled by Wesmael as belonging to a particular species is generally more than the number of specimens of that species which he recorded as being in his possession at the time of the description. Wesmael stated, for instance, that he possessed one female of *affinis* but three specimens in the collection are so labelled by him. Again, a specimen (*abdominator*) labelled *fragilis* in Wesmael's handwriting has a second label bearing the date 1838 and could not therefore have been part of the original material of *fragilis*. The determination label is indistinguishable, however, from those on the rest of the series labelled *fragilis* which includes other misidentified specimens. I suspect therefore that Wesmael labelled his collection long after the publication of the descriptions of his species, probably after 1838, and that he included subsequently captured material which he had not examined with the meticulous care displayed in his original publication. I do not consider it at all likely that Wesmael had before him mixed series when preparing his descriptions because these are far too precise to have been based on badly sorted material.

Ratzeburg (1844; 1848; 1852) described (in the genus *Perilitus*) nine new species of *Meteorus*. Ratzeburg's descriptions are deficient even by the standards of his contemporaries and so some of his species are impossible to interpret without types. Ratzeburg's collection was largely destroyed during the 1939–45 war and Königsmann (1964) has shown that the remnant of the collection which survives contains specimens which can be accepted as type-material of only two of the species of *Meteorus* which Ratzeburg described.

Ruthe (1862) described 20 new species of *Meteorus* in a posthumous paper which was usefully annotated by Reinhard. I have been able to examine all of Ruthe's original material most of which is housed in the BMNH. Ruthe placed too much emphasis on minor differences in colour and consequently only one of his species remains valid.

Marshall (1887; 1891; 1898; 1899) gave a comprehensive interpretation of the work of Haliday and Wesmael and to a lesser extent of other continental workers. He deprived himself, however, of the use of many valuable characters by his method of mounting his specimens face down on squares of card. Marshall described two species of *Meteorus* as new, only one of which is presently considered valid, and brought forward a description of a third (*Capron* in Marshall, 1887).

Thomson (1895), in typically idiosyncratic fashion, put forward 10 new names in *Meteorus* of which five were re-interpretations of names used by Haliday or by Ruthe and five proposed as undoubtedly new to science. Despite his procedural eccentricities Thomson's work was superior to that of his predecessors (save only Wesmael) and, indeed, to that of most of his successors. Thomson's collection is well preserved in Lund and I have had the opportunity of examining the material. Four of Thomson's species remain valid. The presence on a pin of a species label in Thomson's handwriting should not be taken as indicating that that specimen was so labelled by Thomson. Labels which were Thomson's drawer labels were transferred to the specimen which stood first in the series above the label when the collection was moved from Thomson's cabinets into more modern cabinets (R. Danielsson, pers. comm.).

Schmiedeknecht (1897) published a key to the European species of *Meteorus* incorporating descriptions of three new species. Schmiedeknecht appears to have based his work almost entirely upon earlier descriptions and this several times led him into misinterpretation. One of his species remains valid.

Morley (1908) reiterated much of Marshall's work on the British species of the genus; his contribution to the subject was insignificant.

Lyle (1914) published some useful data on the biology of some species of *Meteorus*; this work needs to be carefully interpreted because Lyle's identification of the parasite species was sometimes inaccurate. I have been able to examine Lyle's collection, now housed in the BMNH, but his material is deprived of much of its value by Lyle's method of mounting insects on large squares of thick card. Lyle described one species which I have placed in synonymy in this paper.

Muesebeck (1923) monographed the Nearctic species of *Meteorus* s.l. and emphasized the value of several important characters which had not been fully exploited in previous work on the genus.

Muesebeck (1939; 1954) described two Palaearctic species of *Meteorus*, one of which is now considered valid.

Fischer (1956–70) has contributed much to the literature on the genus and though he has misinterpreted some of the older species he has established some useful synonymy and has designated a neotype for *M. vexator*.

Tobias (1976) has keyed the species of *Meteorus* which are represented in the fauna of the Caucasus.

Nineteenth-century hymenopterists were handicapped in their understanding of the limits of species by their practice of working with relatively few specimens of each species. Many so-called species were founded upon one or two specimens which differed but little from already-described taxa. Then too, the reliance on colour differences to distinguish species has been a fertile source of misinterpretation; colour in *Meteorus* is the least stable characteristic and in no case is colour alone sufficient to distinguish species in the absence of more stable morphological differences. There have been only two keys to major parts of the Palaearctic *Meteorus* fauna (Marshall, 1891; Schmiedeknecht, 1897). Both of these works contained a plethora of putative species because of the authors' acceptance of differences in colour as indicating different species. Also both largely derived their concepts of species from published descriptions which were often imprecise or misleading. I have based my interpretation of the species upon the original material wherever possible together with much other material of the species involved and I have arrived at my concept of these species in the light of the characters discussed below.

Taxonomic characters

The antennal segments vary slightly within a species in number, shape and relative length, but nevertheless provide characteristics of considerable usefulness if the possibilities of variation are borne in mind. The antennae exhibit marked sexual dimorphism in most species; within a given species those of the female are almost always shorter than those of the male, not only because they have fewer segments on average but also because the segments are themselves shorter.

The shape of the head is generally extremely stable within a species. The shape of the temples as seen from above, the lateral profile of the face, the frons and the vertex and the shape in face view of the vertex, genae and clypeus often furnish diagnostic characters of great value. The length of the malar space and the breadth of the face in relation to its height are also of considerable significance; both are related largely to the size and disposition of the eyes.

The degree of convergence of the eyes is an extremely useful character for the differentiation of species in *Meteorus*. Its full significance does not appear to have been noticed by previous workers. When the distance between the tops of the eyes (at their point of intersection with the apparent 'edge' of the head) is twice or more the breadth of the face (the minimum distance between the eyes) I have called the eyes 'strongly convergent' (Fig. 4), otherwise 'not strongly convergent'. More subtle differences in convergence will only be appreciated with the aid of the various figures. For the proper appreciation of this character the head must be examined directly from in front so that the bases of the hind ocelli are upon the 'horizon'. This character is subject to only minor variation in most species though there is considerable sexual dimorphism, the eyes of the male usually being much less convergent than those of the female. The size of the eyes is also often of considerable importance in distinguishing species, particularly their length in dorsal view in relation to the length of the temple.

The size of the ocelli varies slightly within a species but is nonetheless of considerable importance at species-group level. Closely related species generally have ocelli of approximately the same size so that this character is of limited use at species level. The comparative size of the ocelli is expressed as the greatest diameter of a hind ocellus compared with its least distance from the border of the nearest eye. In the text this is expressed in the form OO (ocellar-ocular distance) = OD (ocellar diameter). I have used the term 'small ocelli' where the ocellar-ocular distance is at least 2.5 times ocellar diameters, and the term 'large ocelli' where the ocellar-ocular distance is at most 2.0 times ocellar diameters.

The amount of twist of the mandibles and their size is constant within a species. The mandibles of different species, however, show considerable differences which are related to other characteristics of the ocelli, the tarsal claws and the head shape as expressed in couplet one of the key to species. The mandibles of some species are small, delicate and strongly twisted so that the lower tooth is behind the upper when viewed from in front, i.e. at right angles to the base of the mandible (Fig. 38). Mandibles of this type tend to be constricted in the middle. Other species have mandibles which are not twisted (i.e. the teeth are in the same plane as the base of the mandible) and these are long and broad and not markedly constricted in the middle (Figs 12, 29). Species do occur in which the mandibles are intermediate in type between these two extremes but nonetheless the mandibular characteristics are most useful in the differentiation of species and do not appear to have been fully exploited by previous workers.

The presence or absence of paired pits in the dorsal surface of tergite one is a useful character for the separation of groups of species in *Meteorus*. Some care is needed for the correct evaluation of this character; in several species without pits there are in some specimens convolutions of the sculpture on the dorsal surface of tergite one which give the appearance of pits at first glance. Where pits are present they are distinct even if small and the ventral borders of the tergite are never joined beneath. In nearly all species which do not have pits in the dorsal surface of tergite one the ventral borders of the tergite are in contact to a greater or lesser extent. Muesebeck (1923) brought to notice the fundamental importance of the degree of contiguity of the ventral borders of tergite one as a character for the separation of species in *Meteorus*. Nixon (1941) made use of this character in his review of the African species of *Meteorus* but it has been largely ignored in more recent work on the genus. There is little or no variation in this structure at the infraspecific level in those species lacking pits and it is therefore a stable and most useful character. *M. pulchricornis*, as I have defined that species, is exceptional in that most specimens have no dorsal pits in tergite one and the ventral borders of the tergite are joined while a few specimens do have true pits and, in these, the ventral borders of the tergite are narrowly separated. Some care is required in tracing the borders of tergite one; their course is not always easy to discern because the lateral faces of the tergite often bear longitudinal striations which can be mistaken for the edge of the tergite. Then too, the sternite at the base of segment one of the gaster is sometimes heavily chitinized and sculptured and this can be confused with the ventral part of the tergite on a superficial examination.

Ovipositor length varies within a species but the range of variation is well defined and fairly small and ovipositor length is therefore a useful character for the differentiation of species in *Meteorus*. Previous workers have generally expressed ovipositor length in relation to the length of the gaster. This is not entirely satisfactory because the gaster is a telescopic structure which can therefore vary in length appreciably within a species. I have expressed ovipositor length as a multiple of the length of tergite one of the gaster. The ovipositor is measured from the base to the tip and not merely the portion of it which, in dorsal view, can be seen projecting beyond the end of the gaster — the exerted part. In many specimens the ovipositor base is concealed by the overlapping terminal tergites of the gaster and so I have taken the apex of the hypopygium as providing the most reliable indication of the position of the ovipositor base. Apart from the differences in length between species the ovipositor shows few structural features which can be used in the differentiation of species and the hypopygium none.

The presence or absence of lobes on the tarsal claws is a useful character for the separation of groups of species in *Meteorus* (Figs 34, 35, 58). This character does not appear to have been noticed by previous workers. There is little variation in claw shape within a species but differences in claw shape between closely related species though often significant are generally rather too subtle to be of use in a key. When examining tarsal claws care must be taken that they are seen in full lateral view, the presence of even a large lobe may otherwise be overlooked.

The venation in *Meteorus* is extremely labile and therefore furnishes far fewer diagnostic features than has often been supposed.

In general the sculptural characteristics of *Meteorus* exhibit a rather wide degree of infraspecific variation. In most species, however, the sculpture of the propodeum and of the sternaulus seem to be rather more stable than that elsewhere and can be of considerable help in distinguishing species. The sculpture of the hind coxa is also often of considerable value in diagnosis of species; in those

species with strongly rugose hind coxae it is rare to find specimens in which the hind coxae are smooth and in those which typically have a smooth, punctate hind coxa it is unusual to find individuals whose coxae bear rugosity and very rarely is this strongly developed. Even where the sculpture varies there tends to be a characteristic pattern of sculptural elements which can often aid in forming a 'picture' of a species. Tergite one, for instance, tends to have a characteristic pattern in each species though specimens occur more or less frequently in which the usually predominant sculptural element is superseded by that which is normally subsidiary.

Size differences in *Meteorus* are often of little taxonomic significance. The size of a parasitoid insect is governed to a certain extent by the size of the host in which it develops. Insects belonging to a species which uses a variety of hosts therefore often differ considerably in their body size. A host species which itself exhibits considerable size differences affects its parasites in the same way.

The morphological terms used in this paper are defined in Richards (1977).

Biology

In general little detailed work has been done on the biology of *Meteorus* and, naturally, most of the attention which has been given to the subject has been focused on the species of potential usefulness in biological control programmes. Tobias (1976) and Marsh (1979) cite the relevant literature. The work of Madel (1963) on the morphology and biology of *colon* (as *fragilis*) is an exceptionally scholarly piece of work and should serve as a model for such studies. Achtelig (1974) gives a fine study of the male genital anatomy in *oculatus* (as *pachypus*).

Most species of *Meteorus* are solitary parasites but *M. rubens* and *M. heliophilus* are gregarious (Marshall, 1887; Lyle, 1914; Tobias, 1976). The mature larvae of some species spin a cocoon suspended by a thread and it is from this habit that the name of the genus is derived. Among the exceptions to this are the gregarious species, which spin their cocoons together in loose heaps, and several species which parasitize wood-boring beetles and which, as far as is known, form stalkless cocoons within the beetles' burrows (Mason, 1973). Lyle (1914) suggested that species of *Meteorus* overwinter as eggs or as immature larvae within the body of the host or as mature larvae within the cocoon; on the evidence so far the last alternative seems the least likely. Rearing data suggest that at least some species of *Meteorus* overwinter in different host species from those which they use in their summer generations. There is no evidence that any species of the genus overwinters as an adult though the possibility remains. Some species of *Meteorus* attack Coleoptera whilst others attack Lepidoptera; there is no evidence that any species of the genus utilizes both groups as hosts. In general, the species which parasitize Coleoptera are those with small eyes and ocelli, simple tarsal claws and stout mandibles though two species, *cespicator* and *micropterus*, have these characteristics but are parasitic on larvae of Lepidoptera. The Coleoptera from which *Meteorus* have been recorded are all species in which the larvae live in concealment, boring in wood, in bark or in fungus. The relatively small eyes and ocelli of these parasites is presumably a reflection of their use of concealed hosts and the consequent necessity for them to rely on non-visual means of detection. *M. cespicator* and *micropterus* have been recorded from hosts the larvae of which are often at least partially concealed. The species of *Meteorus* which parasitize Lepidoptera generally have large eyes and ocelli, lobed tarsal claws and slender, strongly twisted mandibles. *M. consimilis* has some of these characteristics, however, and has been recorded (in the literature) only from *Scolytus multistriatus* (Marshall). The majority of the Lepidoptera from which *Meteorus* species have been recorded are those with larvae which do not live in concealment though tortricid larvae are generally partly concealed and most noctuid larvae expose themselves only after dark. The larvae of some species of Lepidoptera rely on camouflage for their protection, those of *Thera variata* (Denis & Schiffermüller), for instance, are exceptionally well camouflaged and only *Meteorus lionotus*, which has exceptionally large eyes and ocelli, has been recorded as parasitizing them. The species of *Meteorus* which parasitize Lepidoptera therefore have large eyes and ocelli, presumably because they are able to use sight in locating their hosts.

M. micropterus, *consimilis* and *abdominator* are similar in appearance; they are dark, heavily sculptured insects with short, dark wings and short, thick legs and antennae. The morphological

similarities of these species probably indicate that they have a common mode of host-searching rather than indicating any close phylogenetic affinity. *M. micropterus* has been recorded from Lepidoptera the larvae of which live at the base of dense herbage such as grass tussocks; it probably hunts on foot and its stout build will enable it the better to push its way into suitable host-habitats. No doubt *consimilis* also reaches its host by pushing through crevices in bark.

M. corax, *sulcatus* and *nixonii* form a distinctive group of species of which *corax* and *sulcatus* are known to parasitize the larvae of cerambycids. The three species have in common a stout basal abdominal segment and a long ovipositor; this is presumably because they need to oviposit through wood.

M. affinis has been recorded from hosts belonging to families of Lepidoptera which are not closely related taxonomically. The larvae of both host-species, however, have a similar mode of life feeding at the base of moss on walls or on tree-stumps.

I have examined specimens of *ictericus* and *obsoletus* bred only from tortricids. Both species are rather small and slender and have long ovipositors the better to reach their host larvae which are typically loosely concealed in rolled leaves, catkins, buds and so on. There is a single record of *ictericus* (as *lophyriphagus*) having been bred from a sawfly. I believe this to have been a fortuitous occurrence because of the abnormal abundance of the larvae of that sawfly at that particular time, or an erroneous host-identification.

In the literature on *Meteorus* there are many records of host-parasite relationships. Much of this information is of doubtful value because of the uncertainty about the accuracy of the identification of the parasites owing to the lack of reliable keys for their determination. With few exceptions I have cited host data only from the specimens I have examined. In order to confirm all records in the literature it would be necessary to redetermine the material on which those records were based, a quite impracticable task. As far as possible I have put into their present combinations the host names which I have cited. This information is summarized in the following list.

List of host records

HOSTS	SPECIES OF <i>Meteorus</i>
COLEOPTERA	
BIPHYLLIDAE	
<i>Biphyllus lunatus</i> (Fabricius)	<i>vexator</i>
SCOLYTIDAE	
<i>Scolytus multistriatus</i> (Marsham)	<i>consimilis</i>
? <i>Scolytus triarmatus</i> Eggers	<i>obfuscatus</i>
CERAMBYCIDAE	
<i>Monochamus saltuarius</i> Gebler	<i>corax</i>
<i>Monochamus sartor</i> (Fabricius)	<i>corax</i>
<i>Semanotus undatus</i> (L.)	<i>sulcatus</i>
<i>Molorchus umbellatarum</i> (von Schreber)	<i>sulcatus</i>
MELANDRYIDAE	
<i>Orchesia micans</i> (Panzer)	<i>longicaudis</i> , <i>obfuscatus</i>
TENEBRIONIDAE	
<i>Eledenoprius armatus</i> Panzer	<i>longicaudis</i>
<i>Corticeus longulus</i> (Gyllenhal)	<i>punctifrons</i>
CISIDAE	
<i>Cis boleti</i> (Scopoli)	<i>profligator</i>
LEPIDOPTERA	
HEPIALIDAE	
<i>Hepialus humuli</i> (L.)	<i>micropterus</i>
<i>Hepialus fusconebulosa</i> (De Geer)	<i>micropterus</i>
ZYGAENIDAE	
<i>Zygaena filipendulae</i> (L.)	<i>unicolor</i>

HOSTS	SPECIES OF <i>Meteorus</i>
TINEIDAE	
<i>Infurcitinea argentimaculella</i> (Stainton)	<i>affinis</i>
<i>Nemapogon granella</i> (L.)	<i>cespicator</i>
? <i>Monopis rusticella</i> (Hübner)	<i>cespicator</i>
<i>Trichophaga tapetzella</i> (L.)	<i>cespicator</i>
GELECHIIDAE	
<i>Pectinophora gossypiella</i> (Saunders)	<i>graciliventris</i>
TORTRICIDAE	
<i>Archips podana</i> (Scopoli)	<i>ictericus</i>
<i>Epiphyas postvittana</i> (Walker)	<i>ictericus</i>
<i>Adoxophyes orana</i> (Fischer von Röslerstamm)	<i>ictericus</i>
<i>Tortrix viridana</i> (L.)	<i>ictericus, obsoletus</i>
<i>Croesia bergmanniana</i> (L.)	<i>ictericus</i>
<i>Acleris hastiana</i> (L.)	<i>ictericus</i>
<i>Epinotia sordidana</i> (Hübner)	<i>ictericus</i>
<i>Gypsonoma dealbana</i> (Frölich)	<i>obsoletus</i>
PYRALIDAE	
<i>Scoparia</i> sp.	<i>affinis</i>
<i>Ephestia cautella</i> (Walker)	<i>graciliventris</i>
LYCAENIDAE	
<i>Thecla betulae</i> (L.)	<i>pulchricornis</i>
NYMPHALIDAE	
<i>Ladoga camilla</i> (L.)	<i>colon</i>
<i>Cynthia cardui</i> (L.)	<i>rubens</i>
<i>Charaxes jasius jasius</i> (L.)	<i>pulchricornis</i>
SATYRIDAE	
<i>Maniola jurtina</i> (L.)	<i>versicolor</i>
LASIOCAMPIDAE	
<i>Poecilocampa populi</i> (L.)	<i>pulchricornis</i>
<i>Malacosoma neustria</i> (L.)	<i>versicolor</i>
<i>Lasiocampa quercus</i> (L.)	<i>versicolor</i>
<i>Macrothylacia rubi</i> (L.)	<i>versicolor</i>
<i>Dendrolimus pini</i> (L.)	<i>versicolor</i>
GEOMETRIDAE	
<i>Idaea muricata</i> (Hufnagel)	<i>rubens</i>
<i>Eulithis testata</i> (L.)	<i>versicolor</i>
<i>Thera obeliscata</i> (Hübner)	<i>lionotus</i>
<i>Thera variata</i> (Denis & Schiffermüller)	<i>lionotus</i>
<i>Thera juniperata</i> (L.)	<i>lionotus</i>
<i>Operophtera brumata</i> (L.)	<i>pulchricornis</i>
<i>Eupithecia nanata</i> (Hübner)	<i>pulchricornis</i>
<i>Anticollix sparsata</i> (L.)	<i>colon</i>
<i>Apeira syringaria</i> (L.)	<i>melanostictus</i>
<i>Ennomos quercinaria</i> (Hufnagel)	<i>melanostictus</i>
<i>Agriopis leucophaearia</i> (Denis & Schiffermüller)	<i>pulchricornis</i>
<i>Agriopis aurantiaria</i> (Hübner)	<i>pulchricornis</i>
THAUMETOPOEIDAE	
<i>Thaumetopoeia processionea</i> (L.)	<i>versicolor</i>
LYMANTRIIDAE	
<i>Dasychira pudibunda</i> (L.)	<i>versicolor</i>
<i>Euproctis chrysorrhoea</i> (L.)	<i>versicolor</i>
<i>Leucoma salicis</i> (L.)	<i>versicolor</i>
<i>Lymantria dispar</i> (L.)	<i>pulchricornis</i>
ARCTIIDAE	
<i>Setina irrorella</i> (L.)	<i>abscissus</i>
NOLIDAE	
<i>Nola cuculatella</i> (L.)	<i>colon, pulchricornis</i>

HOSTS

SPECIES OF *Meteorus*

NOCTUIDAE

<i>Agrotis exclamationis</i> (L.)	<i>rubens</i>
<i>Agrotis ipsilon</i> (Hufnagel)	<i>rubens</i>
<i>Noctua pronuba</i> (L.)	<i>rubens</i>
<i>Noctua fimbriata</i> (Schreber)	<i>heliophilus</i>
<i>Lycophotia porphyrea</i> (Denis & Schiffermüller)	<i>gyrator, pulchricornis, versicolor</i>
<i>Diarsia brunnea</i> (Denis & Schiffermüller)	<i>gyrator</i>
<i>Xestia triangulum</i> (Hufnagel)	<i>heliophilus</i>
<i>Xestia xanthographa</i> (Denis & Schiffermüller)	<i>gyrator</i>
<i>Anarta myrtilli</i> (L.)	<i>versicolor</i>
<i>Polia nebulosa</i> (Hufnagel)	<i>heliophilus</i>
<i>Mamestra brassicae</i> (L.)	<i>rubens</i>
<i>Lacanobia oleracea</i> (L.)	<i>gyrator</i>
<i>Orthosia stabilis</i> (Denis & Schiffermüller)	<i>heliophilus</i>
<i>Mythimna</i> sp.	<i>gyrator</i>
<i>Cleoceris viminalis</i> (Fabricius)	<i>gyrator</i>
<i>Lithophane ornitopus</i> (Hufnagel)	<i>heliophilus</i>
<i>Eupsilia transversa</i> (Hufnagel)	<i>pulchricornis</i>
<i>Agrochola lota</i> (Clerck)	<i>gyrator</i>
<i>Thalpophila matura</i> (Hufnagel)	<i>gyrator</i>
<i>Euplexia lucipara</i> (L.)	<i>gyrator</i>
<i>Ipimorpha retusa</i> (L.)	<i>gyrator</i>
<i>Cosmia trapezina</i> (L.)	<i>gyrator</i>
<i>Spodoptera exigua</i> (Hübner)	<i>rubens</i>
<i>Bena prasinana</i> (L.)	<i>colon</i>

HYMENOPTERA

DIPRIONIDAE

<i>Neodiprion sertifer</i> (Geoffroy in Fourcroy)	<i>ictericus</i>
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***METEORUS* Haliday**

Meteorus Haliday, 1835: 24. Type-species: *Meteorus pendulator* (Latreille), by subsequent designation (Haliday in Westwood, 1839: 61, Synopsis).

Saprotichus Holmgren, 1868: 430. Type-species: *Saprotichus chinensis* Holmgren, by subsequent designation (Viereck, 1914: 130).

DIAGNOSIS. *Meteorus* is a Euphorine (as defined, for instance, by van Achterberg, 1974) which can be differentiated by the following combination of characters.

Notaulices always present, generally distinct; first segment of gaster narrow at base and broadened apically, never cylindrical, the spiracles at midpoint of segment or slightly behind, occasionally in front but never at base; hair rows on tergites restricted to a single subapical row; ovipositor always exerted; forewing with three submarginal cells, the second generally higher than long (Fig. 13), generally quadrangular, often slightly narrowed anteriorly and rarely triangular, never petiolate; radial cell of hindwing narrowed to apex or parallel-sided never apically broadened or divided.

Meteorus has been recorded from all zoogeographical regions.

Meteorus was placed in a subfamily, Meteorinae, distinct from though related to the Euphorinae until Muesebeck (1923: 4) pointed out the artificial nature of this division and (1935: 5) placed *Meteorus* within the Euphorinae. This placement of the genus has been generally accepted by workers on Braconidae and no modern authority on the group retains *Meteorus* as distinct at more than tribal level. Support for this placement of the genus has come from the work of Capek (1970) on larval morphology and biology, and from that of van Achterberg (1974; 1979) and Tobias (1966; 1976) on adult morphology.

Mason (1973) lifted from synonymy the genus *Zemiotes*, previously regarded as a part of *Meteorus*, and postulated a relationship between *Zemiotes* and *Zelee*. I have accepted Mason's division of *Meteorus* s.l. into two genera but have followed van Achterberg's (1979) placement of the

two genera together in the Meteorini. Further, van Achterberg (1979) has shown that the name *Zele* is properly applied to the species hitherto placed in *Zemiotes*. He has lifted from synonymy the name *Homolobus* Foerster to accommodate the species traditionally placed in *Zele*. The two genera in the Meteorini may be distinguished as follows.

Radial cell of hindwing narrowed to apex or parallel-sided, never divided, the radial vein not angled; hairs on tergites restricted to single apical rows; tarsal claws sometimes without a basal lobe; tergite one sometimes without dorsal pits **METEORUS** Haliday

Radial cell of hindwing widened to apex, sometimes divided, radial vein always angled; hairs on tergites not in single rows, covering at least apical half of tergite; tarsal claws always strongly bent and with large basal lobe; tergite one always with dorsal pits **ZELE** Curtis

Synonymic list of species

abdominator (Nees)

brunnipes Ruthe **syn. n.**

brevipesalis Shenefeldt **syn. n.**

abscissus Thomson

affinis (Wesmael)

punctiventris Ruthe **syn. n.**

ruthei Schmiedeknecht **syn. n.**

voloscensis Fischer **syn. n.**

brevicauda Thomson

thuringiacus Schmiedeknecht **syn. n.**

mongolicus Fahringer **syn. n.**

cespicator (Thunberg)

atrator (Curtis)

similator (Nees)

ambiguus Ruthe **syn. n.**

cinctellus (Spinola)

fuscipes (Wesmael) **syn. n.**

tenellus Marshall **syn. n.**

colon (Haliday)

fragilis (Wesmael) **syn. n.**

fasciatus (Ratzeburg)

luridus Ruthe **syn. n.**

consimilis (Nees)

brevipes (Wesmael)

albicornis Ruthe

corax Marshall

monochami Fischer

eadyi sp. n.

filator Haliday

laticeps (Wesmael) **syn. n.**

hodisensis Fischer **syn. n.**

graciliventris Muesebeck

gyrator (Thunberg)

scutellator (Nees)

parvulus Thomson **syn. n.**

heliophilus Fischer

hirsutipes sp. n.

ictericus (Nees)

minutus (Thunberg)

ephippium (Curtis)

xanthomelus (Wesmael)

confinis Ruthe **syn. n.**

fallax Ruthe **syn. n.**

pleuralis Ruthe **syn. n.**

liquis Ruthe **syn. n.**

consors Ruthe

crassicus Thomson **syn. n.**

lophyriphagus Fahringer **syn. n.**

adoxophyesi Minamikawa **syn. n.**

jaculator (Haliday)

obscorellus Ruthe

tenuicornis Thomson **syn. n.**

lionotus Thomson

ruficoloratus Fischer **syn. n.**

longicaudis (Ratzeburg)

melanostictus Capron

niger Lyle **syn. n.**

micropterus (Haliday)

nixonii sp. n.

obfuscatus (Nees)

thoracicus (Curtis)

formosus (Wesmael)

fodori Papp **syn. n.**

obsoletus (Wesmael)

viridanae Johansson **syn. n.**

oculatus Ruthe

pachypus Schmiedeknecht **syn. n.**

pallipes (Wesmael)

nigritarsus Ruthe **syn. n.**

profligator (Haliday)

pulchricornis (Wesmael)

striatus Thomson **syn. n.**

thomsoni Marshall

japonicus Ashmead

nipponensis Viereck

macedonicus Fischer **syn. n.**

graeffei Fischer

tuberculifer Fischer **syn. n.**

punctifrons Thomson

rubens (Nees)

leviventris (Wesmael)

islandicus Ruthe

medianus Ruthe

scutatus Costa **syn. n.**

heteroneurus Thomson

szechuanensis Fahringer **syn. n.**

mesopotamicus Fischer **syn. n.**

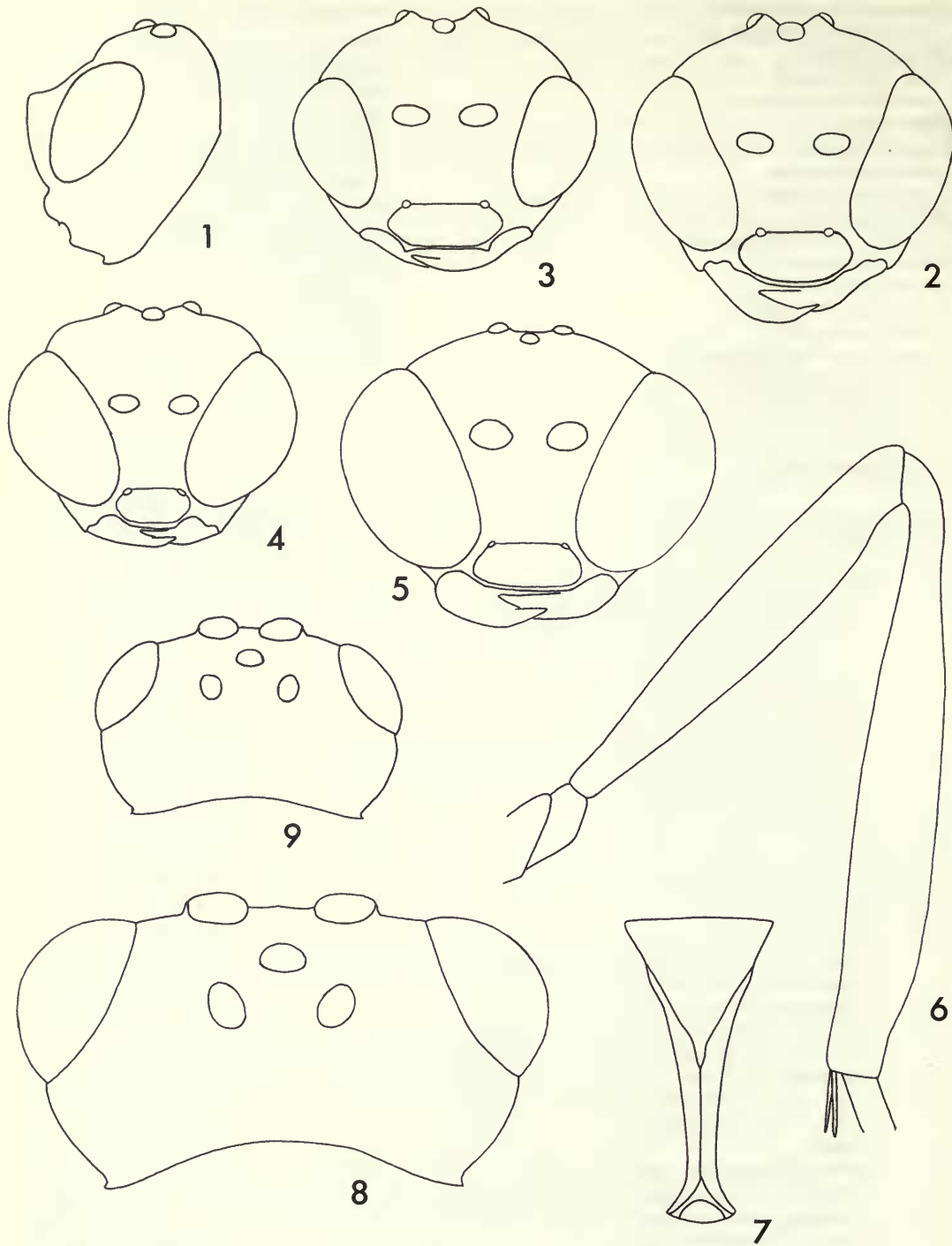
salicorniae Schmiedeknecht
ocellatus Watanabe **syn. n.**
sulcatus Szépligeti
insignis Muesebeck
molorchi Fischer **syn. n.**
tabidus (Wesmael)
fascialis Ruthe
dubius Ruthe **syn. n.**
pentheri Fischer **syn. n.**
unicolor (Wesmael)
chinensis (Holmgren) **syn. n.**
versicolor (Wesmael)
bimaculatus (Wesmael)
brevicornis (Ratzeburg)
decoloratus Ruthe
camptolomae Watanabe **syn. n.**
ikonomovi Fischer **syn. n.**
hartigi Shenefelt **syn. n.**

vexator (Haliday)
 NOMINA DUBIA
dejeanus (Rondani)
delator (Haliday)
dilutor (Ratzeburg)
effeminatus Ruthe
flaviceps (Ratzeburg)
gracilis (Ratzeburg)
longicornis (Ratzeburg)
pallidus (Nees)
pendulator (Latreille)
rubriceps (Ratzeburg)
ruficeps (Nees)
rufus (De Geer)
stenostigma Thomson
wesmaeli (Boie)

Key to species (females)

I am unable to give a key to males. In *Meteorus*, as in many parasitic Hymenoptera, males of closely related species are often impossible to separate. Also there are several species of which I have seen no males.

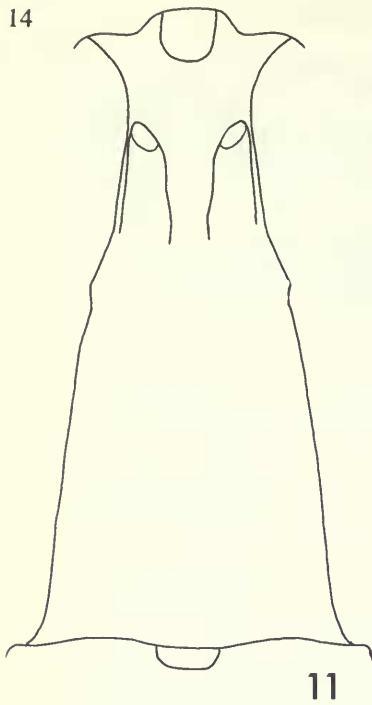
- 1 Ocelli small, OO (ocellar-ocular distance) at least 2 times OD (ocellar diameter), usually more; tarsal claws simple (Figs 34, 35), without a distinct basal lobe but sometimes swollen at the base or with a small tubercle on the inner side of the claw; mandibles large, stout and not strongly twisted (Figs 12, 29); generally head full and rounded behind the eyes and in front view rather square, the face broad and the eyes small (but cf. Figs 2, 4, 5) 2
- Ocelli large, OO at most 2 times OD (except in *cinctellus*); tarsal claws with a well-developed lobe (Fig. 58) (except in *consimilis* and in *rubens*); mandibles most usually small and strongly twisted (Fig. 38); generally head contracted behind eyes and in front view rather triangular in outline, being more or less contracted ventrally and the eyes large 19
- 2 (1) Dorsal pits absent, the ventral borders of tergite one joined from near the base of the segment to about its midpoint (Fig. 7) 3
- Dorsal pits present, the ventral borders of tergite one not touching, usually widely separated 5
- 3 (2) Flagellar segments obconical, mostly only as long as broad, only the first segment as much as twice as long as broad; frons flattened and face strongly protuberant, forming a 'shelf' upon which the antennae are mounted (Fig. 1); propodeum strongly reticulate-rugose and without distinct carinae *micropterus* (Haliday) (p. 39)
- At least the basal flagellar segments cylindrical and not less than 3 times as long as broad; face not strongly protuberant; propodeum only weakly rugose and with distinct carinae 4
- 4 (3) Antennae short, 21- to 24-segmented, the three preapical segments only slightly longer than broad, submoniliform; basal segments of flagellum lighter in colour than apical segments; eyes large, convergent (Fig. 2); ovipositor about 2.5 times length of tergite one *filator* (Haliday) (p. 30)
- Antennae longer, 26- to 27-segmented, all segments at least twice as long as broad, cylindrical; basal segments of the flagellum not distinctly lighter in colour than apical segments; eyes smaller, very little convergent (Fig. 3); ovipositor about 1.5 times length of tergite one *eadyi* sp. n. (p. 29)
- 5 (2) Eyes strongly convergent, face at most as wide as high (Figs 4, 5) 6
- Eyes not strongly convergent, face broader than high, usually about twice as broad as high 7
- 6 (5) Hind tibia strongly swollen, about as wide as femur (Fig. 6); tergite one longitudinally striate, sometimes rugose medially; antennae 30- to 33-segmented; eye about 3 times as long as temple *oculatus* Ruthe (p. 42)



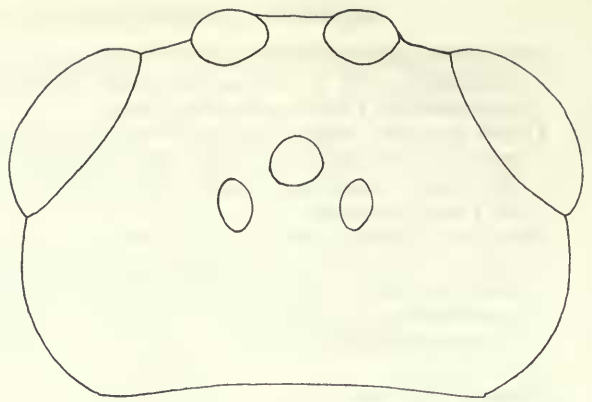
Figs 1-9 1, *Meteorus micropterus* (Haliday), head, lateral view. 2, *M. filator* (Haliday), head, frontal view. 3, *M. eadyi* sp. n., head, frontal view. 4, *M. vexator* (Haliday), head, frontal view. 5, 6, *M. oculatus* Ruthe; (5) head, frontal view; (6) hind leg. 7, *M. filator* (Haliday), segment one of gaster, ventral view. 8, *M. nixoni* sp. n., head, dorsal view. 9, *M. sulcatus* Szépligeti, head, dorsal view. All figures $\times 43$.

- Hind tibia not strongly swollen, distinctly narrower than femur; tergite one reticulate-rugose, occasionally with a longitudinal striate element laterally; antennae 20- to 24-segmented; eye about twice length of temple *vexator* (Haliday) (p. 53)
- 7 (5) Tergite one stout, broad at base and with spiracles distinctly before the middle, dorsal pits large (Fig. 11); tergite two usually strongly sculptured and with distinct thyridiae; hind tibia usually swollen and basally lighter in colour; ovipositor always long, at least 3 times length of tergite one 8
- Tergite one slender at base and with spiracles at about mid-segment, dorsal pits smaller; tergite two smooth, never strongly sculptured and thyridiae obsolescent; hind tibia rarely swollen or basally lighter in colour; ovipositor sometimes distinctly less than three times length of tergite one 10
- 8 (7) Temples shorter than eyes (Fig. 8); clypeus wide, mandibles large, not twisted (Fig. 12) *nixonii* sp. n. (p. 40)
- Temples longer than eyes (Figs 9, 10); clypeus narrow, mandibles short, strongly twisted 9
- 9 (8) Propodeum rather flat in profile, not carinate, rugose; clypeus smooth-punctate; second submarginal cell at least 1.5 times as high as wide (Fig. 13); antennae 31- to 36-segmented *sulcatus* Szepligetii (p. 49)
- Propodeum divided by a strong medial transverse carina into dorsal and posterior planes which are sharply angled one to the other; clypeus vertically carunculate; second submarginal cell about as high as wide (Fig. 14); antennae 39- to 41-segmented *corax* Marshall (p. 28)
- 10 (8) Ovipositor long, at least 3.0 times length of tergite one; sternaulus reticulate-rugose or reticulate-foveolate, at least anteriorly; hind coxa generally rugose 11
- Ovipositor shorter, at most 2.5 times length of tergite one, if, rarely, slightly more (*salicorniae*) then frons depressed and face strongly protuberant (Fig. 20); sternaulus narrow, foveolate or, if broad and reticulate-rugose (*abdominator*), wings strongly infumate; hind coxa generally smooth, punctate 13
- 11 (10) Head subcubic, temples longer than eyes (Fig. 15); tergite one predominantly coarsely rugose with only a few striae laterally; a small species 2.5–3.0 mm in length *jaculator* (Haliday) (p. 36)
- Head more transverse, temples shorter than eyes or at most equal (Fig. 16); tergite one striate and with a reticulate medial longitudinal band; generally larger species 4–5 mm in length 12
- 12 (11) Eyes large, convergent (Fig. 17); malar space shorter than basal breadth of mandible, face about 1.5 times as broad as high; antennae short, at most 27-segmented; face generally almost completely rugulose, rarely completely punctate *cespicator* (Thunberg) (p. 24)
- Eyes smaller, less strongly convergent (Fig. 18); malar space about equal to basal breadth of mandible; face about twice as broad as high; antennae longer, 29- to 32-segmented; face densely punctate with at most a trace of rugulose sculpture beneath the base of the antenna *longicaudis* (Ratzeburg) (p. 38)
- 13 (10) Sternaulus broad and strongly reticulate-rugose, at least anteriorly; pronotum strongly rugose; wings infumate, the second submarginal cell strongly narrowed anteriorly; ocelli minute, OO=3.5–4.0 times OD and head transverse (Fig. 19) *abdominator* (Nees) (p. 20)
- Sternaulus narrow, foveolate; pronotum generally mostly smooth; wings hyaline, the second submarginal cell only slightly narrowed anteriorly; ocelli usually larger, if minute then head not distinctly transverse 14
- 14 (13) Face strongly convex medially, frons depressed, occiput distinctly concave (Fig. 20) propodeum strongly reticulate-rugose with no distinctly differentiated carinae *salicorniae* Schmiedeknecht (p. 48)
- Face evenly and only weakly convex, frons not depressed, occiput at most weakly concave; propodeum with scattered rugae and with distinct carinae 15
- 15 (14) Clypeus narrower than face (Figs 22, 23, 24); mandibles at least slightly twisted 16
- Clypeus as broad as the face (Figs 25, 26); mandibles not twisted 18
- 16 (15) Antennae short, the segments in the apical half of the flagellum not longer than broad; vertex rather flat in front view (Fig. 22); eyes larger; clypeus protuberant *obfuscatus* (Nees) (p. 41)
- Antennae longer, at most one or two segments of flagellum not longer than broad; vertex rounded in front view (Figs 23, 24); eyes smaller; clypeus rather flat 17

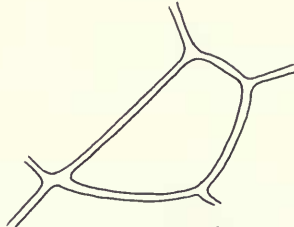
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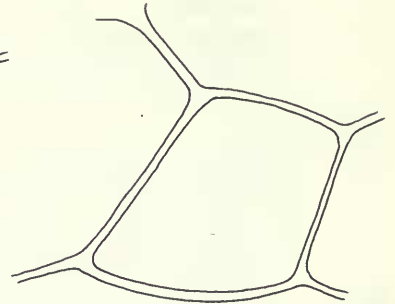
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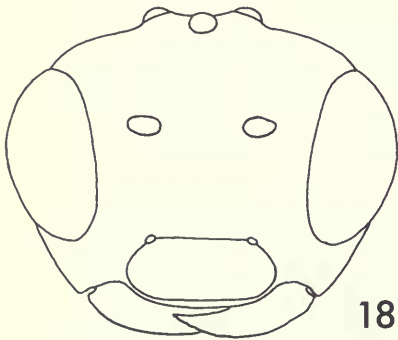
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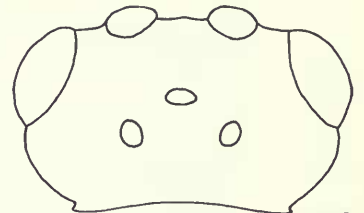
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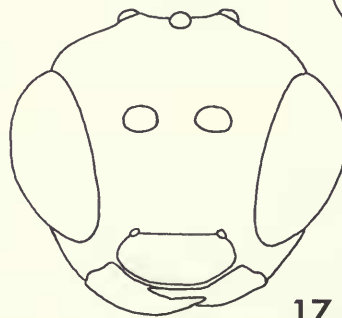
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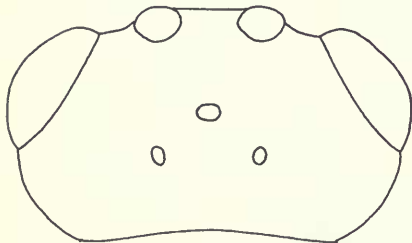
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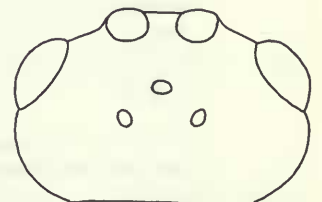
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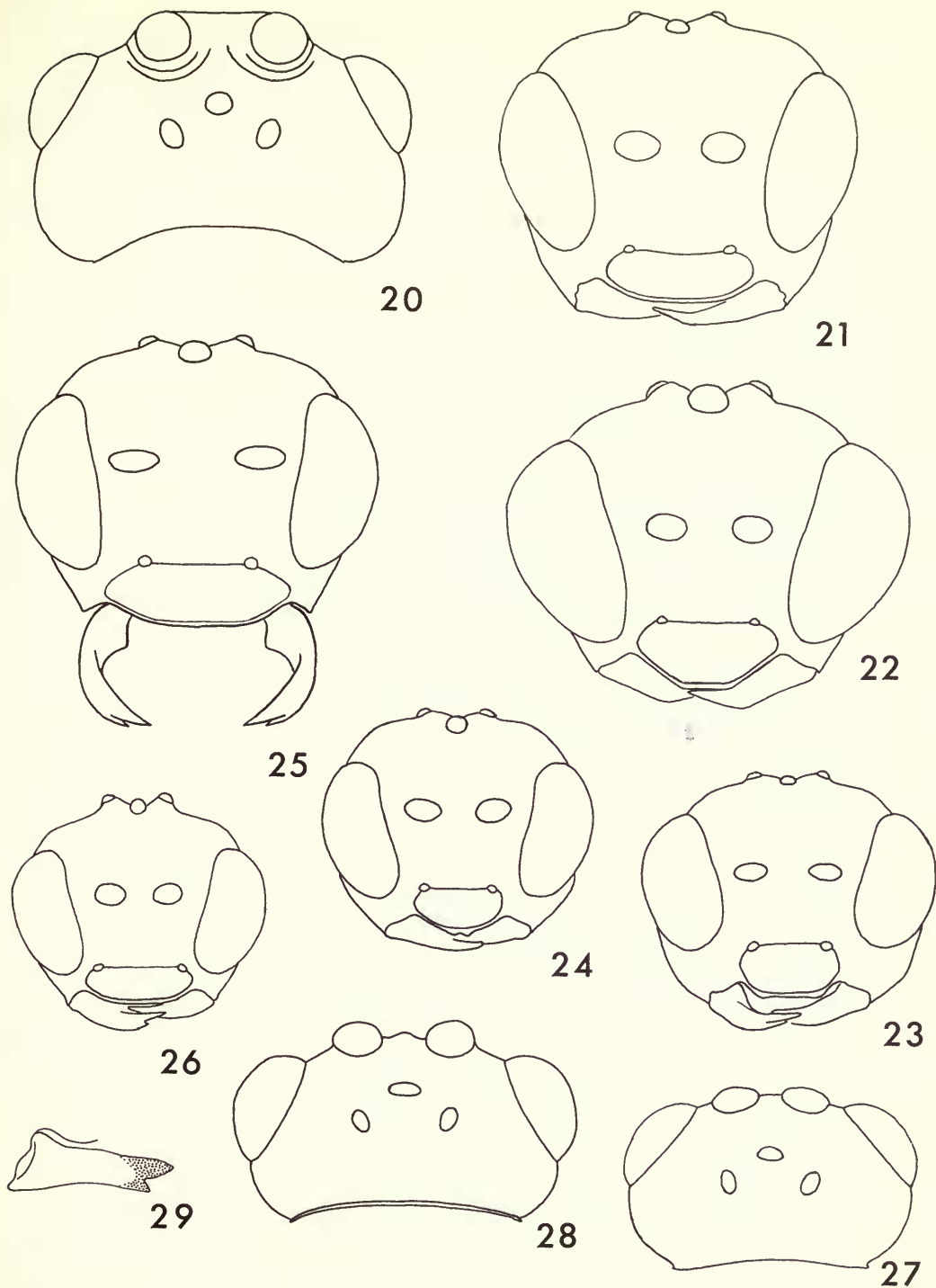


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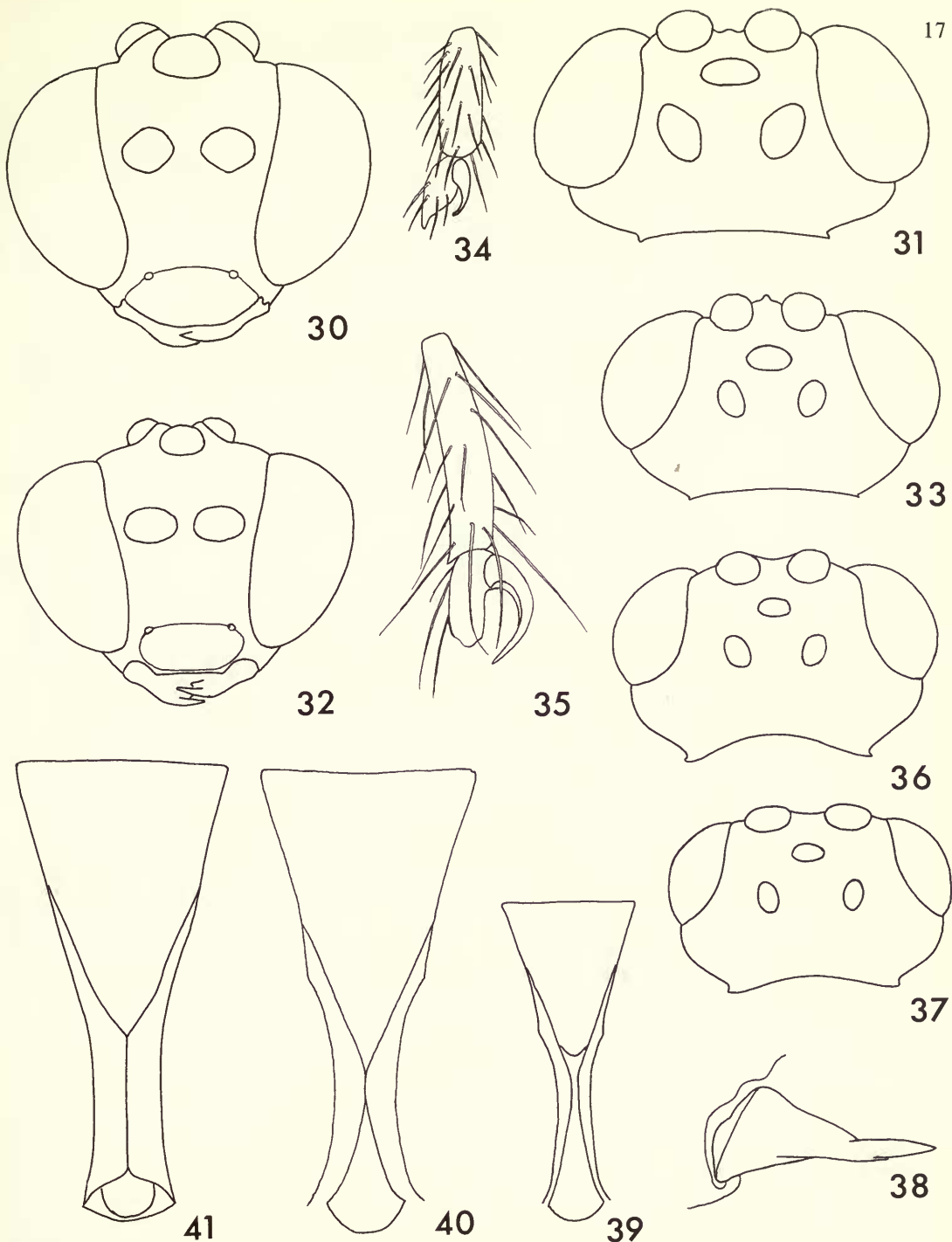
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Figs 10–19 10, 11, *Meteorus corax* Marshall; (10) head, dorsal view; (11) segment one of gaster, dorsal view. 12, *M. nixonii* sp. n., mandible. 13, *M. sulcatus* Szépligeti, 2nd submarginal cell of forewing. 14, *M. corax* Marshall, 2nd submarginal cell of forewing. 15, *M. jaculator* (Haliday), head, dorsal view. 16, 17, *M. cespitator* (Thunberg); (16) head, dorsal view; (17) head, frontal view. 18, *M. longicaudis* (Ratzeburg), head, frontal view. 19, *M. abdominalator* (Nees), head, dorsal view. All figures $\times 43$.

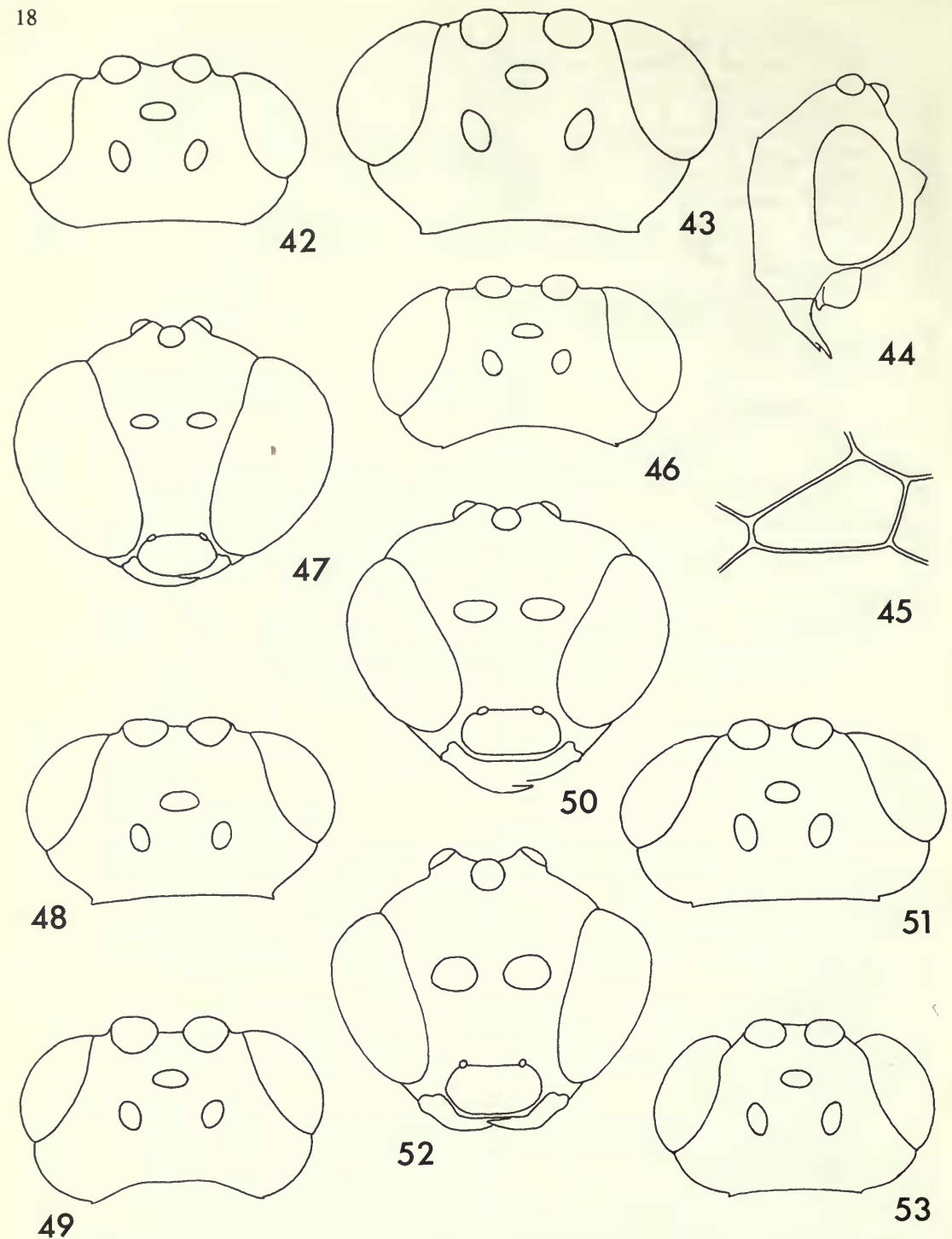


Figs 20–29 20, *Meteorus salicorniae* Schmiedeknecht, head, dorsal view. 21, *M. abdominalator* (Nees), head, frontal view. 22, *M. obfuscatus* (Nees), head, frontal view. 23, *M. punctifrons* Thomson, head, frontal view. 24, *M. profligator* (Haliday), head, frontal view. 25, *M. hirsutipes* sp. n., head, frontal view. 26, 27, *M. brevicauda* Thomson; (26) head, frontal view; (27) head, dorsal view. 28, 29, *M. hirsutipes* sp. n.; (28) head, dorsal view; (29) mandible. All figures $\times 43$ except Fig. 29 $\times 107$.

- 17 (16) Frons between anterior ocellus and eye with a patch of large distinct punctures separated by less than their own diameter; height of eye at most equal to breadth of face (Fig. 23); legs conspicuously long, hind tibia and tarsus equal in length to thorax and gaster; ovipositor short, down-curved *punctifrons* Thomson (p. 46)
- Frons with smaller punctures separated by much more than their own diameter; height of eye distinctly greater than breadth of face (Fig. 24); legs not conspicuously long, hind tibia and tarsus together distinctly shorter than thorax and gaster; ovipositor slightly longer, straight *profligator* (Haliday) (p. 44)
- 18 (15) Temples about as long as eyes, less strongly contracted (Fig. 27); ovipositor 1.5 times as long as tergite one; legs short, stout; tarsal claws shorter, thicker (Fig. 34) *brevicauda* Thomson (p. 23)
- Temples distinctly shorter than eyes, strongly contracted (Fig. 28); ovipositor 2.5 times length of tergite one; legs long, slender; tarsal claws very long, slender (Fig. 35) *hirsutipes* sp. n. (p. 33)
- 19 (1) Dorsal pits absent or, occasionally, weakly indicated, the ventral borders of tergite one touching or at most with a narrow gap between them 20
- Dorsal pits distinct, the ventral borders of tergite one not touching, usually widely separated 27
- 20 (19) Tergite one not joined beneath at the base of the segment and either joining shortly in front of the middle of the segment or a small gap remaining (Figs. 39, 40) 21
- Tergite joined beneath at the base of the segment (Fig. 41) 26
- 21 (20) Eyes strongly convergent; ocelli small, OO about 2.5 times OD *cinctellus* (Spinola) (p. 25)
- Eyes not strongly convergent; ocelli larger, OO at most 2.0 times OD 22
- 22 (21) Antennae short, 24- to 28-segmented; tarsal claws not strongly curved and with a very small basal lobe or with none; mandible fairly large and moderately twisted *rubens* (Nees) (p. 47)
- Antennae longer, usually with 30 or more segments; tarsal claws strongly curved and with a pronounced basal lobe; mandible small, strongly twisted 23
- 23 (22) Head strongly narrowed behind eyes (Figs. 31, 33); length of eye 2.5–3.0 times length of temple 24
- Head less strongly narrowed behind eyes (Figs. 36, 37); length of eye at most twice length of temple 25
- 24 (23) Ocelli very large, OO=0.5 times OD (Fig. 31); head more strongly contracted behind eyes *lionotus* Thomson (p. 37)
- Ocelli not so large, OO=1.0–1.5 times OD (Fig. 33); head less strongly contracted behind eyes *heliophilus* Fischer (p. 32)
- 25 (23) Clypeus evenly and densely punctate with a dense pile of erect hairs; frons not tuberculate; propodeum in lateral view rounded, strongly rugose dorsally and with no distinct carinae; recurrent antefurcal or interstitial *pulchricornis* (Wesmael) (p. 45)
- Clypeus with scattered punctures and a few scattered long hairs; frons with a blunt tubercle in front of the fore ocellus (Fig. 44); propodeum in lateral view flattened and often with a central longitudinal carina; recurrent always distinctly postfurcal (Fig. 45) *colon* (Haliday) (p. 26)
- 26 (20) Eyes strongly protuberant (Fig. 43), large, temple generally strongly contracted, not rounded; ovipositor thick, strongly constricted just before apex, generally short, 1.5 times length of tergite one, occasionally twice; propodeum short, wide, strongly excavate medially *versicolor* (Wesmael) (p. 51)
- Eyes not strongly protuberant (Fig. 42), smaller, temple not strongly contracted, rounded; ovipositor slender, not strongly constricted at apex, generally longer, 2.5 times length of tergite one but sometimes only twice; propodeum not conspicuously short and wide and only weakly excavate medially *obsoletus* (Wesmael) (p. 41)
- 27 (19) Eyes strongly convergent or, if only moderately convergent (Fig. 52) then length of eye in dorsal view 2.5–3.0 times length of temple; ovipositor long, always at least 2.5 times length of tergite one 28
- Eyes at most moderately convergent (Fig. 56); length of eye at most twice length of temple (Figs 55, 57); ovipositor not more than twice length of tergite one 32
- 28 (27) Length of eye 4 times length of temple (Fig. 46); OO=1.25–1.5 times OD; eyes strongly convergent (Fig. 47) *graciliventris* Muesebeck (p. 31)

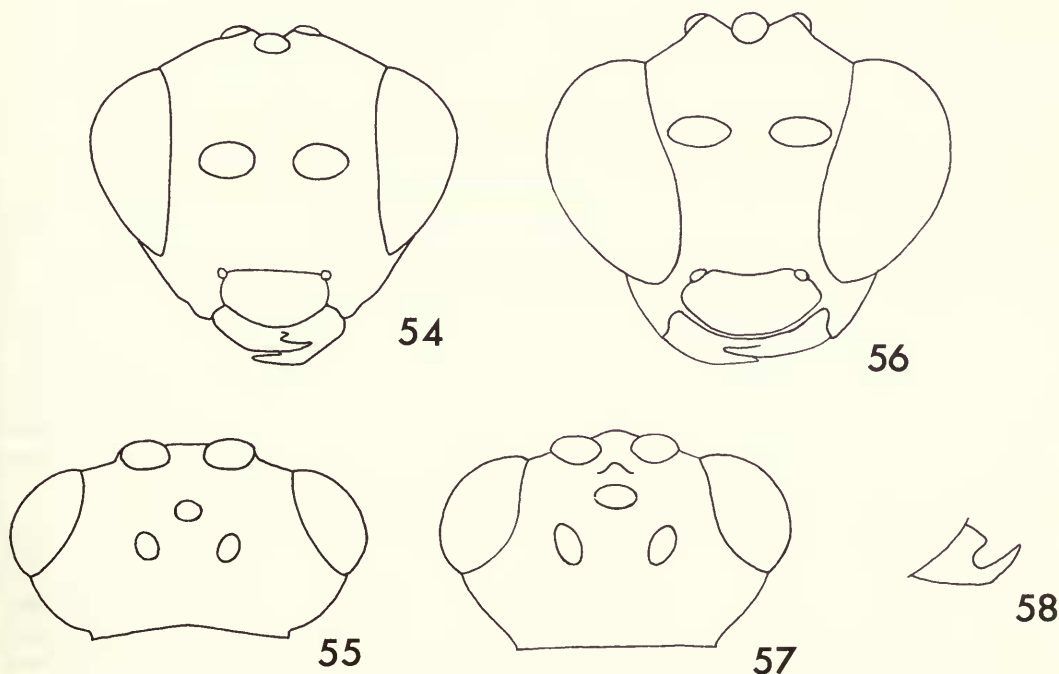


Figs 30–41 30, 31, *Meteorus lionotus* Thomson; (30) head, frontal view; (31) head, dorsal view. 32, 33, *M. heliophilus* Fischer; (32) head, frontal view; (33) head, dorsal view. 34, *M. brevicauda* Thomson, tarsal claws. 35, *M. hirsutipes* sp. n., tarsal claws. 36, *M. pulchricornis* (Wesmael), head, dorsal view. 37, *M. rubens* (Nees), head, dorsal view. 38, *M. lionotus* Thomson, mandible. 39, *M. cinctellus* (Spinola), segment one of gaster, ventral view. 40, *M. lionotus* Thomson, segment one of gaster, ventral view. 41, *M. versicolor* (Wesmael), segment one of gaster, ventral view. All figures $\times 43$ except Figs 34, 35 and 38 $\times 107$.



Figs 42–53 42, *Meteorus obsoletus* (Wesmael), head, dorsal view. 43, *M. versicolor* (Wesmael), head, dorsal view. 44, 45, *M. colon* (Haliday); (44) head, lateral view; (45) 2nd submarginal cell of forewing. 46, 47, *M. graciliventris* Muesebeck; (46) head, dorsal view; (47) head, frontal view. 48, *M. tabidus* (Wesmael), head, dorsal view. 49, *M. affinis* (Wesmael), head, dorsal view. 50, 51, *M. pallipes* (Wesmael); (50) head, frontal view; (51) head, dorsal view. 52, 53, *M. ictericus* (Nees); (52) head, frontal view; (53) head, dorsal view. All figures $\times 43$.

- Length of eye at most 3 times length of temple; if OO less than 2.0 times OD then eyes only moderately convergent 19
- 29 (28) Outer surface of hind coxa strongly rugose or reticulate-rugose; anteriorly the mesopleuron beneath the sternaulus reticulate-rugose or reticulate-foveolate; tergite one often rugose, at least centrally 30
- Outer surface of hind coxa smooth with at most some puncturation; sternaulus foveolate, the sculpture often partly obsolescent so that the sternaulus is in part a smooth furrow; mesopleuron smooth-punctate with no reticulate sculpture beneath the sternaulus; tergite one longitudinally striate, usually without rugosity 31
- 30 (29) Head in dorsal view (Fig. 48) contracted behind the eyes, not strongly rounded, the occiput not concave; vertex always with a light yellow patch on the orbit opposite the hind ocellus; mesopleuron beneath the sternaulus reticulate-rugose so that the sternaulus appears to be a broad reticulate-rugose band; pronotum laterally strongly reticulate-rugose *tabidus* (Wesmael)(p. 50)
- Head in dorsal view (Fig. 49) not contracted behind eyes, strongly rounded, the occiput concave; vertex rarely pale-marked; mesopleuron beneath the sternaulus rarely reticulate-rugose though often reticulate-foveolate anteriorly; pronotum laterally smooth sometimes rugose, rarely reticulate *affinis* (Wesmael)(p. 22)
- 31 (29) Eyes strongly convergent (Fig. 50); temples rounded, not strongly contracted (Fig. 51); ocelli smaller OO = 2.0 times OD *pallipes* (Wesmael)(p. 43)
- Eyes moderately convergent (Fig. 52); temples less rounded, strongly contracted (Fig. 53); ocelli larger OO = 1.0-1.5 times OD *ictericus* (Nees)(p. 34)
- 32 (27) Sternaulus broad, reticulate-rugose or, if narrow foveolate then length of malar space about twice basal breadth of mandible; propodeum coarsely reticulate-rugose without a distinct central longitudinal carina and frons not tuberculate; hind coxa generally strongly rugose 33



Figs 54-58 54, 55, *Meteorus consimilis* (Nees); (54) head, frontal view; (55) head, dorsal view. 56, *M. gyrator* (Thunberg), head, frontal view. 57, *M. melanostictus* Capron, head, dorsal view. 58, *M. ictericus* (Nees), tarsal claw. All figures $\times 43$ except Fig. 58 $\times 107$.

- Sternaulus narrow foveolate and length of malar space not more than basal breadth of mandible; propodeum weakly rugose and generally with a distinct central longitudinal carina or the frons has a blunt tubercle in front of fore ocellus; hind coxa generally smooth, punctate 35
- 33 (32) Malar space long, almost twice basal breadth of mandible (Fig. 54); ovipositor at most equal in length to tergite one, down-curved; second submarginal cell most usually strongly narrowed anteriorly; flagellum pale banded *consimilis* (Nees) (p. 27)
- Malar space shorter, not more than basal breadth of mandible; ovipositor 1.5–2.0 times length of tergite one, straight; second submarginal cell only slightly narrowed anteriorly; basal segments of flagellum sometimes paler than apical segments but never with a distinct pale band 34
- 34 (33) Clypeus rather flat, finely and densely punctured and with a dense erect pile; hind coxa almost completely rugose; pterostigma dark with a pale outer border *abscissus* Thomson (p. 21)
- Clypeus protuberant, more coarsely punctate-rugulose and with scattered long hairs; hind coxa rugose only laterally; pterostigma uniformly pale *unicolor* (Wesmael) (p. 51)
- 35 (32) Antenna longer, 30- to 34-segmented; frons with no tubercle but often with a weakly impressed line in front of fore ocellus; propodeum finely rugose, often reticulate-rugose, generally with a central longitudinal carina which, though weak, is distinct; medial transverse carina sometimes present but never strongly raised *gyrator* (Thunberg) (p. 31)
- Antenna shorter, 25- to 27-segmented; frons with a blunt tubercle in front of the fore ocellus (Fig. 57); propodeum more coarsely rugose, generally with no central longitudinal carina but with a strongly raised medial transverse carina *melanostictus* Capron (p. 38)

Descriptions of species

Meteorus abdominalator (Nees von Esenbeck)

(Figs 19, 21)

Perilitus abdominalator Nees von Esenbeck, 1811: 24. Syntypes ♂ ♀, GERMANY (destroyed).

[*Perilitus brevipes* Wesmael; Wesmael, 1838: 141. Misidentification: see *brevipesalis* below.]

Perilitus brunnipes Ruthe, 1862: 37. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus brevipesalis Shenefelt, 1969: 55. Holotype ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels) [examined]. [Proposed as a new name for '*brevipes* Wesmael, 1838'.] **Syn. n.**

I have based my interpretation of *abdominator* on specimens in Wesmael's collection labelled 'Perilitus abdominalator NVE' in Wesmael's handwriting. Wesmael was the first revisor of *abdominator*.

Wesmael (1835) described *brevipes* solely from males but later (1838) he published a description of a single female which he considered to belong to *brevipes*. As pointed out by Marshall (1887: 110) this led Ruthe (1862: 34) to describe the true female of *brevipes* as *albicornis* though he expressed doubt about the correctness of his action. There is one female specimen in Wesmael's collection which agrees with Wesmael's description of the supposed female of *brevipes* and which bears a label 'Perilitus brevipes mihi' in Wesmael's handwriting. This specimen comes within the limits of variation of *abdominator*.

Ruthe (1862: 38) stated that his description of *brunnipes* was based on six female specimens. In the collection of the BMNH there are six specimens from Ruthe's collection standing above the name 'brunnipes', two of them bearing labels 'P. brunnipes M.' in Ruthe's handwriting. These specimens are conspecific and agree with Ruthe's description of *brunnipes*. They come within the limits of variation of *abdominator*. I have chosen as lectotype the specimen labelled 'BM Type Hym. 3C750'. Fischer (1970b: 275) suppressed *brunnipes* as a synonym of *Zemiotes deceptor* (Wesmael). The latter species has recently been synonymized with *Z. albiditarsus* (Curtis) (van Achterberg, 1979). Van Achterberg (in litt.) states that in the MNHU, Berlin there are specimens of *albiditarsus* identified as *brunnipes*. It seems probable that Fischer's interpretation of *brunnipes* was based on these wrongly-identified specimens.

♀. Antennae short, 22- 25-segmented, distal segments of flagellum only slightly longer than broad. Head slightly broader than thorax; distinctly transverse; temples contracted but not strongly so. Ocelli small, $OO=3.5-4.0$ times OD . Eyes generally only slightly convergent, never strongly so. Face always transverse, about twice as broad as high; protuberant; generally rather smooth-punctate. Malar space slightly shorter than basal breadth of mandible. Tentorial pits deep. Clypeus strongly protuberant, divided from face by a deep distinct furrow, smooth with relatively few large punctures. Mandible stout, twisted. Frons depressed, usually completely smooth-punctulate but occasionally with a small patch of rugosity just above the antennal sockets and also sometimes with scattered larger punctures along the margin of the eye. Vertex polished, punctulate. Genae swollen so that the head is rather broad ventrally in front view (Fig. 21). Pronotum expanded forwards and sideways, strongly rugose, sometimes reticulate-rugose except for a smooth polished band dorsally. Mesonotum polished, punctate, the middle lobe often strongly so; notaulices deep, foveolate. Sternaulus broad, reticulate-rugose with particularly strong vertical rugae; rest of mesopleurae smooth-punctulate except for the subalar prominence. Propodeum coarsely rugose, often reticulate-rugose, at least in part; longitudinal and transverse carinae present but often obscured by the rugosity; distinctly excavate medio-posteriorly. Tergite one stout, with distinct dorsal pits; longitudinally striate dorsally, the lateral surfaces rugose at the base and sometimes also striate. Sternite of segment one thickened in its basal half and finely reticulate-rugose. Ovipositor 2.0-2.5 times length of tergite one; down-curved. Legs stout; hind coxae smooth-punctate, sometimes rugose dorsally but this rugosity often weak. Tarsal claws not strongly bent but swollen at the base. Wings short; second submarginal cell generally more or less strongly contracted anteriorly.

Colour black; legs, tegulae and usually tergite 2 and tergite 3 at base testaceous; basal flagellar segments often lighter in colour than rest, sometimes yellow. In darker specimens the legs and the tergites are darker brownish testaceous and the flagellar segments are all dark. Hind legs often darker at the apex of the femur, tibia and tarsus. Wings always at least slightly infumate, often densely so.

♂. Same as female except antennae longer, 25- to 31-segmented, all flagellar segments generally at least twice as long as broad; colour often darker.

MATERIAL EXAMINED

143 ♀, 71 ♂. **Belgium, France, Germany, Great Britain, Hungary, Ireland, Italy, Netherlands, Poland, Sweden, Switzerland.**

HOSTS. No reared material examined.

REMARKS. *M. abdominalis* is superficially similar to *micropterus* and *consimilis*; this question is touched upon in the discussion of *micropterus*. *M. abdominalis* is rather variable in sculptural characteristics and in venation.

Meteorus abscissus Thomson

[*Meteorus pulchricornis* Wesmael; Ruthe, 1862: 40. Misidentification.]

Meteorus abscissus Thomson, 1895: 2156. LECTOTYPE ♀, SWEDEN (ZI, Lund), here designated [examined].

Ruthe stated that he possessed one specimen of this species which he referred to *pulchricornis* though he expressed some doubt as to the correctness of his identification. There is a specimen present in the collection of the BMNH bearing a label 'P.pulchricornis Wsm' in Ruthe's handwriting which fits the description given by Ruthe of that species. Thomson (1895: 2156) stated that Ruthe's *pulchricornis* differed from that of Wesmael and put forward a new name, *abscissus*, for the former species. There are six specimens in Thomson's collection standing above the name 'abscissus' and these are conspecific with Ruthe's specimen of 'pulchricornis' and agree precisely with what Thomson wrote about *abscissus*.

♀. Antennae 30- to 33-segmented, thick at base tapering to apex, all flagellar segments distinctly longer than broad. Head broad, temples strongly contracted behind eyes, eyes at most twice length of temple Ocelli large, $OO=2$ times OD . Eyes large, moderately convergent. Malar space about equal to basal breadth of mandible. Face 1.5 times as wide as high, not strongly protuberant, with weak transverse rugae though sometimes smooth, punctate laterally. Clypeus not strongly protuberant, sometimes flattened, densely and regularly punctate and with a dense erect pile. Mandibles small, strongly twisted. Pronotum laterally strongly reticulate-rugose; notaulices deep-foveolate, coalescing posteriorly to form a strongly rugose area. Sternaulus broad, reticulate-rugose, rest of mesopleuron smooth-punctate except dorsally where it is reticulate-rugose. Prepectal carina strongly raised. Propodeum broad, strongly convex, strongly reticulate-rugose dorsally and

posteriorly. Tergite one long with distinct dorsal pits and shallow glymmae; dorsal surface finely striate; lateral surface at the base smooth, shining. Ovipositor 1.5–2.0 times length of tergite one, straight. Hind coxa strongly rugose, reticulate-rugose dorsally and sometimes laterally, often transversely rugose ventrally. Tarsal claws with a distinct basal lobe.

Colour brownish testaceous, legs testaceous; propodeum and tergite one sometimes black wholly or in part; thorax, head and hind coxa also sometimes black-marked.

♂. Same as ♀ except that antenna longer, 34- to 36-segmented; tergite one narrower; sculpture of hind coxa sometimes obsolescent.

MATERIAL EXAMINED

9 ♀, 4 ♂. **Austria:** 1 ♂, Südtirol, Partschins, 20.vii.1966 (*Haeselbarth*) (EH, Munich). **Hungary:** 1 ♀, Budapest, Hármashatárhegy, 6.vi.1972 (*Papp*) (HNHM, Budapest); 1 ♀, Hársbókorhegy, 15.viii.1952 (*Bajari*) (HNHM, Budapest). **Ireland:** 1 ♂, Co. Clare, Fanore, 10.vi.1974 (*West*), ex larva of *S. irrorella* (BMNH). **Italy:** 2 ♂, Riva s. Garda (*Haeselbarth*) (EH, Munich). **Sweden:** 1 ♀, Sk., Horna, 5.ix.1967 (Hedqvist) (HC, Stockholm); 6 ♀, Thomson coll. (ZI, Lund).

HOST. *Setina irrorella* (L.) (Lepidoptera: Arctiidae).

REMARKS. *M. abscissus* is structurally very close to *pulchricornis* but has a flatter clypeus and the pronotum, sternaulus, propodeum and hind coxa are more strongly rugose; it is also a rather stouter insect. *M. pulchricornis* generally has no true dorsal pits on tergite one but there is likely to be considerable difficulty in the separation of those specimens of *pulchricornis* with pits and specimens of *abscissus*.

Meteorus affinis (Wesmael)

(Fig. 49)

Perilitus affinis Wesmael, 1835: 31. Holotype ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB Brussels) [examined].

Meteorus punctiventris Ruthe, 1862: 25. Holotype ♀, GERMANY: Ruthe collection (BMNH) [examined].

Syn. n.

Meteorus gracilis Ruthe, 1862: 31. Holotype ♀, GERMANY: Ruthe coll. (BMNH) [examined]. [Junior primary homonym of *gracilis* Ratzeburg, 1852: see *ruthei* below.]

Meteorus ruthei Schmiedeknecht, 1897: 205. [Replacement name for *gracilis* Ruthe, 1862.] **Syn. n.**

Meteorus voloscensis Fischer, 1959: 14. Holotype ♀, YUGOSLAVIA: Volosca, coll. Graeffe (NM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 31) stated that he possessed only a single female of the species. In Wesmael's collection there are three specimens labelled 'Perilitus affinis mihi' in Wesmael's handwriting. Only one of these specimens, which I consider to be the holotype, fits the description of *affinis*, therefore Fischer (1970a: 52) has unnecessarily designated this specimen as lectotype of *affinis*.

Ruthe (1862: 27) stated that he possessed but one female specimen of *punctiventris*. In Ruthe's collection there is one female labelled 'P. punctiventris m.' in Ruthe's handwriting; this specimen agrees with Ruthe's description and I therefore accept it as the holotype of *punctiventris*.

Ruthe (1862: 31) stated that he possessed only a single female of *gracilis*. This specimen now stands in the collection of the BMNH; it is in rather poor condition, being broken and embedded in a mass of glue. The specimen bears a label 'P. gracilis m' in Ruthe's handwriting and agrees with his description of that species. I regard this specimen as the holotype of *gracilis*; it is within the limits of variation of *affinis*.

Fischer (1959: 14) postulated that his new species *voloscensis* was related to *vexator* and cited differences in venation to support the differentiation of the two species. The large ocelli and lobed tarsal claws of *voloscensis* show that it is not closely related to *vexator*; it does, however, come well within the limits of variation of *affinis*.

♀. Antennae 27- to 30-segmented, the penultimate five or so segments only about 1.5 times as long as broad. Head strongly rounded behind eyes, occiput rather concave, length of eye at least twice length of temple. Ocelli large, OO = 1.5–2.0 times OD. Eyes large, protuberant, strongly convergent. Face about as broad as high, not protuberant, rugulose. Clypeus smooth, shining with scattered punctures, not strongly protuberant. Malar space short, much less than basal breadth of mandible. Mandible stout, moderately twisted. Pronotum

smooth laterally except for a median band of strong vertical rugae, sometimes rugose ventrolaterally, rarely reticulate-rugose. Sternaulus foveolate, sometimes smooth posteriorly and, usually, anteriorly coalescing with a patch of reticulate-foveolate sculpture on the mesopleuron beneath the sternaulus, occasionally there is reticulate-rugose sculpture in this area and rarely the sculpture there is obsolete (this is characteristic of small specimens); rest of mesopleurae shining punctulate except for a subalar patch which is reticulate-foveolate. Propodeum rugose, the carinae not usually distinctly differentiated from the rugae, transverse carinae the most well-developed. Tergite one narrow, about twice as long as apically broad, with distinct dorsal pits; dorsal surface striate laterally and with a medial longitudinal band of reticulate sculpture; the lateral surface of tergite one rugose anteriorly and striate posteriorly. Ovipositor long, 3.0–3.5 times length of tergite one, slender. Legs long, slender; hind coxae rugose ventrolaterally; tarsal claws with small but distinct lobe.

Colour black; legs yellow except sometimes hind coxa black and tarsi infuscated; clypeus, mandibles, prothorax centrally and tergite two often lighter in colour, sometimes yellow; head and mesothorax occasionally also lighter in colour.

♂. Same as ♀ except antennae longer, 30- to 33-segmented; eyes smaller and not strongly convergent; temples sometimes longer and less contracted; sculpture of sternaulus and of hind coxa often obsolescent.

MATERIAL EXAMINED

46 ♀, 17 ♂. **Bulgaria, Finland, France, Great Britain, Ireland, Netherlands, Sicily.**

HOSTS. *Infurcitinea argentimaculella* (Stainton) (Lepidoptera: Tineidae) larvae feeding on moss on wall. I have also examined a single male of this species reared from a larva feeding at the base of moss on a dead tree stump and identified as either *Gelechia* sp. (Lepidoptera: Gelechiidae) or *Scoparia* sp. (Lepidoptera: Pyralidae). Marshall (1887: 108) recorded *Scoparia* as the host of this species (as *punctiventris*).

The specimens reared from *Infurcitinea argentimaculella* (5 ♀, 2 ♂, England, Kent, Faversham, 9.vii.1977 (Bradford) (MSC, Reading)) are considerably smaller than average specimens of *affinis*. If Marshall's record of *Scoparia* as the usual host of *affinis* is correct then the smaller size of the parasites from *Infurcitinea* corresponds to the difference in size of the two hosts.

REMARKS. The smaller specimens of *affinis* are difficult to separate from *vexator*. They have 24- to 26-segmented antennae, sternaulus and hind coxal sculpture obsolescent; in these characteristics and in size they are close to *vexator* but they have the lobed claws and larger ocelli of *affinis*. The reduction in antennae and in sculpture is no doubt a result of their reduction in size due to their choice of a small host species.

Meteorus brevicauda Thomson

(Figs 26, 27, 34)

Meteorus brevicauda Thomson, 1895: 2165. LECTOTYPE ♀, SWEDEN (ZI, Lund), here designated [examined].

Meteorus thuringiacus Schmiedeknecht, 1897: 190. Syntypes ♀, GERMANY (lost). **Syn. n.**

Meteorus mongolicus Fahringer, 1935: 10. Holotype ♀, CHINA: S. Kansu (*Hummel*) (NR, Stockholm) [examined]. **Syn. n.**

In Thomson's collection there are three conspecific specimens standing above the name *brevicauda*. I have selected as lectotype of this species the specimen labelled by Fischer as holotype. The lectotype has no locality label, the second specimen is labelled 'Satrop 3.8.81, the third 'Hbg' (= Hälsingborg).

Thomson (1896: 2165) tentatively suggested that *brevicauda* and *profligator* might be the same species. Schmiedeknecht (1897: 299) placed *brevicauda* in unquestioned synonymy with *profligator* from which it was removed, in my view correctly, by Fischer (1959: 75). Having so disposed of *brevicauda*, Schmiedeknecht was misled into describing that species as *thuringiacus*. The description of *thuringiacus* agrees precisely with *brevicauda* and with no other species and I have no doubt that the two are conspecific, although I have been unable to locate original material of *thuringiacus*. I have examined one specimen labelled 'Meteorus thuringiacus Schmiedek.' in Schmiedeknecht's handwriting but this specimen is a male and therefore could not have been part of the syntype-series which was stated to be all female.

The holotype of *mongolicus* is well within the limits of variation of *brevicauda*.

♀. Antennae 24- to 27-segmented, all segments at least slightly longer than broad. Head rounded behind eyes but not strongly contracted; length of temple about equal to length of eye in dorsal view. Ocelli small, OO=3 times OD. Eyes not strongly protuberant, converging slightly. Malar space very short, distinctly less than half basal breadth of mandible. Face about 2 times as broad as high, rather flat, laterally punctate, medially reticulate-punctate with a trace of rugulose sculpture. Clypeus large, as wide as face, flat, polished and with scattered large punctures. Tentorial pits large. Mandibles large, stout, not twisted. Pronotum projects in front of mesonotum forming a 'neck', laterally smooth. Mesonotum short, polished, punctate; notaulices narrow, foveolate. Sternaulus foveolate, rest of mesopleuron polished, punctate. Propodeum short with distinct carinae between which are obsolescent rugae. Tergite one with distinct dorsal pits and glymmae, dorsal surface striate laterally, the striae turning inwards distally and joining the reticulate medial area of the tergite. Ovipositor short, about 1.5 times length of tergite one. Legs short, the hind coxa smooth, punctate; tarsal claws with no basal lobe but slightly swollen at the base.

Colour black except antenna at base, clypeus, mandibles, prothorax ventrally testaceous, tegulae and legs yellow.

♂. Only one specimen examined and this lacks a head; rest of body same as ♀.

MATERIAL EXAMINED

5 ♀, 1 ♂. **Austria**: 1 ♀, Südtirol, St. Peter, Ahrntal, 25.viii.1967 (*Haeselbarth*) (EH, Munich). **Germany**: 1 ♂, 'Schmiedeknecht coll.' (CNC, Ottawa). **Poland**: 1 ♀, Polanowice, 10 km N. of Wroclaw, 15.vii.1957 (*Pulawski*) (RNH, Leiden). **Sweden**: 2 ♀, Thomson coll. (paralectotypes of *Meteorus brevicauda* Thomson) (ZI, Lund); 1 ♀, Vörmland, Stöllet, 30.vi.-19.vii.1975 (*van Rossem*) (RNH, Leiden).

HOSTS. No reared material available.

Meteorus cespitator (Thunberg)

(Figs 16, 17)

Ichneumon cespitator Thunberg, 1822: 269. Holotype ♀, SWEDEN (UDE, Uppsala) [examined].

Zelee atrator Curtis, 1832: folio 415. Syntypes, GREAT BRITAIN: 'Wilts, Durnford House' (NMV, Melbourne) [not examined]. [Synonymized by Roman, 1912: 289.]

Perilitus similator Nees von Esenbeck, 1834: 41. Syntypes ♀, GERMANY (destroyed). [Synonymized by Haliday, 1835: 32.]

Meteorus ambiguus Ruthe, 1862: 30. Holotype ♀, GERMANY: Ruthe coll., 4.10.55 (BMNH) [examined].

Syn. n.

There is one specimen in Thunberg's collection standing above the name *cespitator*. I regard this specimen as the holotype of the species. It is in poor condition but is nevertheless readily identifiable. I have based my concept of *atrator* on specimens in the BMNH collection which have been identified as that species by G. E. J. Nixon who examined Curtis' collection in 1948 and chose a type-specimen but never validated this selection by publication.

Ruthe (1862: 31) stated that he possessed one female of *ambiguus* captured on 4 October, 1855. A specimen bearing these data now stands in the collection of the BMNH; it agrees with the description of *ambiguus* and also bears a label in Ruthe's handwriting: '*P. ambiguus* m'. I regard this specimen as the holotype of the species. It comes within the limits of variation of *cespitator* except that the flagellar segments are all distinctly longer than broad.

♀. Antennae short, 23- to 27-segmented, the apical twelve or so segments of the flagellum short, not or very little longer than broad. Head transverse, temples shorter than eyes. Ocelli small, OO=2.5-3.0 times OD. Eyes large, protuberant, convergent but not strongly so (Fig. 17). Malar space distinctly shorter than basal breadth of mandible. Face about 1.5 times as broad as high, protuberant, generally completely rugulose but sometimes smooth, punctate laterally and occasionally, especially in smaller specimens, more or less completely smooth, punctate. Clypeus not strongly protuberant but distinctly divided from face, smooth but with large punctures, these are sometimes dense, particularly at the sides of the clypeus, so that they form a reticulate-punctate pattern. Tentorial pits distinct. Mandibles large, stout, moderately twisted. Pronotum projecting in front of the mesonotum, laterally rugose but this is sometimes reduced so that the area is smooth, shining. Notaulices deep, foveolate, rest of mesonotum densely punctate. Sternaulus deep and, at least medially, irregularly reticulate-rugose, generally with a reticulate-foveolate area beneath; the sculpture of the sternaulus is sometimes obsolescent in smaller specimens; rest of mesopleurae smooth, with minute punctures. Propodeum irregularly rugose with carinae distinct in all but the most heavily sculptured

specimens in which the carinae merge with the rugose sculpture. Tergite one striate dorsally, the striae turning inwards towards the apex of the tergite, occasionally joining together medially but generally coalescing in a regularly reticulate-rugose, medial longitudinal area. Ovipositor long, 3–4 times length of tergite one. Hind coxae rugose, generally strongly so but in smaller specimens the sculpture is often obsolescent; tarsal claws long, slightly swollen at base but not lobed.

Colour black; clypeus, face, prothorax ventrally often orange-testaceous, legs testaceous often the hind coxa basally and the hind tibia apically infusate, occasionally the hind leg almost completely dark brown-testaceous; middle tergites of gaster sometimes testaceous. Some specimens from older collections have a dull reddish body colour which I suspect to be due to fading, possibly exacerbated by over-exposure to cyanide in the killing-jar (see also discussion of *consimilis* and of *filator*).

♂. No material available.

MATERIAL EXAMINED

73 ♀. **France, Germany, Great Britain, Hungary, Ireland, Luxemburg, Netherlands, Norway, Sweden.**

HOSTS. *Nemapogon granella* (L.), *Trichophaga tapetzella* L., *Tineola* sp., (Lepidoptera: Tineidae). Van Burgst recorded (as *jaculator*) the specimens reared from *T. tapetzella* L.; I have examined these specimens and consider them to belong to *cespicator*. I have also examined specimens recorded as 'probably ex *Monopis rusticella* infesting barn owl pellets' [*Monopis rusticella* (Hübner) (Lepidoptera: Tineidae)].

REMARKS. I have examined one specimen which I think probably belongs to this species but in which the eyes are less convergent and which therefore has a face almost twice as broad as high. The face is also densely reticulate-punctate and facially the specimen therefore resembles *longicaudis*. In all other structural features, however, it comes within the limits of variation of *cespicator*.

Meteorus cinctellus (Spinola)

(Fig. 39)

Bracon cinctellus Spinola, 1808: 135. Holotype ♂, ITALY (MZS, Turin) [examined].

Perilitus fuscipes Wesmael, 1835: 48. Holotype ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels) [examined]. **Syn. n.**

Meteorus tenellus Marshall, 1887: 125. LECTOTYPE ♀, GREAT BRITAIN (BMNH), here designated [examined]. **Syn. n.**

Two specimens (♂ and ♀) presently stand above the name 'cinctellus' in Spinola's collection. The original description was based on a single male specimen and I therefore consider the male in Spinola's collection to be the holotype. *M. cinctellus* has been correctly interpreted by most authors although many of them have incorrectly attributed authorship of the species to Nees, who first described the female sex.

Wesmael stated that he possessed only one female specimen of *fuscipes*; one such specimen presently stands in Wesmael's collection. It is labelled 'Perilitus fuscipes mihi' in Wesmael's handwriting and agrees precisely with his description of the species except that the darker colours are somewhat faded. I regard this specimen as the holotype of *fuscipes*; it comes within the limits of variation of *cinctellus*.

Marshall (1887: 125) based his description of *tenellus* on six female specimens reared by Bignell from *Peronea* [*Acleris*] *hastiana* (L.). Two female specimens from Marshall's collection stand above the name *tenellus* in the BMNH collection. They are mounted together on a square card on the underside of which is written the host data cited by Marshall. The two specimens are conspecific and agree with the description of *tenellus* and I have no doubt that they are syntypes of that species. I have chosen the right-hand specimen as lectotype and have so marked it. Marshall distinguished *tenellus* from *cinctellus* by the relatively shorter length of the narrow proximal part of the first segment. I have found that the proportions of the first tergite exhibit considerable variation within a species and I therefore consider *tenellus* to come within the limits of variation of *cinctellus*.

♀. Antennae 24- to 29-segmented: distal flagellar segments not much longer than broad. Head contracted behind eyes, generally more or less rounded, eyes almost twice as long as temples; frons rather depressed

with a blunt tubercle in front of the fore ocellus. Ocelli small, $OO=2.5$ times OD . Eyes large, protuberant, strongly convergent. Malar space short, clearly shorter than the basal breadth of the mandible. Face about as high as broad, sometimes smooth, punctate but often at least partly rugose, the rugae joining to form a medial tubercle just below the antennal sockets. Clypeus narrow, at most as wide as face; strongly protuberant; polished with large punctures. Tentorial pits deep. Mandible small, strongly twisted. Pronotum generally rugose, occasionally smooth, at least in part. Notaulices thin, shallow, foveolate. Sternaulus deeply impressed, foveolate, generally broadened anteriorly by a patch of reticulate-foveolate beneath; rest of mesopleuron polished, punctulate except for a reticulate area beneath the subalar prominence; mesolcus deep, foveolate. Propodeum regularly rugose, sometimes reticulate-rugose; generally with a strong medial transverse carina, other carinae usually indistinct except occasionally when the rugosity is reduced. Propodeum generally rather flat with a long dorsal surface. Tergite one long, slender in basal half; dorsal pits absent, ventral borders generally touching at about middle of segment but occasionally open; spiracles distinctly behind midpoint of segment; dorsal surface longitudinally striate, the striae generally running towards the middle of the segment distally, often reticulate-rugose at mid-segment and occasionally also at the base but more usually smooth at base. Ovipositor 2.0–2.5 times length of tergite one. Legs long, slender; hind coxae rugose, often reticulate-rugose, at least on the dorsal surface. Tarsal claws small and difficult to see but with a distinct basal lobe.

Colour black; legs and generally tergite 2 testaceous; often basal half of flagellum and head in part brownish testaceous; mesonotum around notaulices often reddish brown; hind legs occasionally dark, at least in part; wings generally slightly embrowned.

♂. Same as ♀ except antenna longer, 28- to 30-segmented; ocelli slightly larger; eyes less strongly convergent; colour often darker.

MATERIAL EXAMINED

281 ♀, 87 ♂. Austria, Finland, France, Germany, Great Britain, Ireland, Italy, Netherlands, Portugal, Sweden, Yugoslavia.

HOST. *Acleris hastiana* (L.) (Lepidoptera: Tortricidae).

REMARKS. The convergent eyes and small ocelli readily distinguish the female of *cinctellus* from closely related species. The male of *cinctellus* is rather similar to that of *colon*; the legs and antennae of *cinctellus*, however, are not as conspicuously long and slender as those of *colon*; the temples of *cinctellus* are more rounded, the eyes less protuberant and the sternaulus more strongly and more extensively sculptured.

Meteorus colon (Haliday)

(Figs 44, 45)

Perilitus (*Meteorus*) *colon* Haliday, 1835: 30. Syntype(s) ♀, IRELAND (lost).

Perilitus fragilis Wesmael, 1835: 52. LECTOTYPE ♂, BELGIUM: Brussels (IRSNB, Brussels), here designated [examined]. **Syn. n.**

Perilitus fasciatus Ratzeburg, 1844: 77. Syntypes ♀, GERMANY (lost). [Synonymized with *fragilis* by Ruthe, 1862: 55.]

Meteorus luridus Ruthe, 1862: 57. LECTOTYPE, ♀, GERMANY: Ruthe collection (BMNH), here designated [examined]. **Syn. n.**

I have based my interpretation of *colon* on a specimen from Stelfox's collection which was named as that species by Stelfox. The specimen agrees precisely with Haliday's description. The descriptions of *colon* and *fragilis* were both published in 1835; Dessart (1972) has shown, however, that Haliday's names were published prior to those of Wesmael and they must therefore take precedence. *M. colon* was placed in synonymy with *fragilis* by Reinhard (*in* Ruthe, 1862: 55). Fischer (1965: 21) employed this synonymy but correctly used the name *colon* for the species with *fragilis* as a synonym. Later, however, Fischer (1970b: 260) lifted *fragilis* from synonymy.

Wesmael stated that he had three males and one female of *fragilis*. In Wesmael's collection above this name there now stand eight specimens labelled 'Perilitus fragilis mihi' in Wesmael's handwriting. Of these eight specimens only two males agree with Wesmael's description of *fragilis* and I have chosen the better-preserved of these as lectotype. None of the other specimens can possibly belong to the syntype-series, disagreeing as they do with the description in most particulars; four of them are *consimilis* and two *abdominator*.

There are 12 specimens standing above the name *luridus* in Ruthe's collection; I have chosen as lectotype the specimen which best fits Ruthe's description of the species and which bears a label in Ruthe's handwriting 'P. luridus m.'. The lectotype and nine other specimens are conspecific with *colon*, the two other specimens are discussed under *heliophilus*.

♀. Antennae 30- to 34-segmented; long, thin, all flagellar segments at least twice as long as broad, the basal two about 4 times as long as broad. Head contracted behind eyes; temple only slightly shorter than eye in dorsal view; head between ocelli and occipital carina flattened, polished; frons with a blunt tubercle in front of the fore ocellus so that, in lateral view, the frons appears angled. Ocelli large but not conspicuously so, OO = 2 times OD. Eyes convergent but not strongly so. Malar space short, slightly less than basal breadth of mandible. Face not strongly protuberant, generally with a transverse striate-rugose element medially. Clypeus strongly protuberant; narrower than face and with widely spaced, large punctures; apical border reflexed. Mandible small, delicate, strongly twisted. Sternaulus foveolate, rest of mesopleurae polished, punctate. Propodeum finely rugose, occasionally reticulate-rugose, carinate but the carinae often weak and indistinct. Tergite one long, slender, without dorsal pits, the ventral borders approaching at the mid point of the segment but generally narrowly separated; ovipositor 1.5 times length of tergite one. Legs very long and slender; hind coxa with only a little rugosity on the dorsal surface; tarsal claws small but with a distinct basal lobe. Recurrent vein always distinctly postfurcal, the second submarginal cell rather elongate (Fig. 45).

Colour black; face, genae inner orbit, propleurae, pronotum posteriorly, mesopleuron ventrally and legs testaceous, sometimes also tergite two is this colour and occasionally the rest of the tergites, the scutellum and the propodeum. Completely yellow specimens occur infrequently.

♂. Same as ♀ except that antenna 31- to 35-segmented.

MATERIAL EXAMINED

123 ♀, 106 ♂. **France, Germany, Great Britain, Ireland, Italy, Netherlands, Sweden, Switzerland, Yugoslavia.**

HOSTS. *Ladoga camilla* (L.) (Lepidoptera: Nymphalidae); *Anticollix sparsata* (Treitschke) (Lepidoptera: Geometridae); *Nola cuculatella* (L.) (Lepidoptera: Nolidae); *Bena prasinana* (L.) (Lepidoptera: Noctuidae).

REMARKS. *M. colon* is a conspicuously slender species with very long, slender antennae and legs. The morphology, anatomy and biology of the species (under the name *fragilis*) has been excellently monographed by Madel (1963).

Meteorus consimilis (Nees)

(Figs 54, 55)

Perilitus consimilis Nees von Esenbeck, 1834: 42. Syntype(s) ♂, GERMANY (destroyed).

Perilitus brevipes Wesmael, 1835: 33. LECTOTYPE ♂, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Synonymized with *albicornis* Ruthe by Marshall, 1887: 110.]

Meteorus albicornis Ruthe, 1862: 34. LECTOTYPE ♀, GERMANY: Ruthe collection (BMNH), here designated [examined]. [Synonymized with *consimilis* by Thomson, 1895: 2160.]

There are four specimens in Wesmael's collection labelled 'Perilitus brevipes mihi' in Wesmael's handwriting. Three of these specimens are males, one of them extensively damaged; the two others are conspecific and agree with the description of *brevipes*, both coming well within the limits of variation of *consimilis*. Ruthe (1862: 35) indicated that he had two specimens of *albicornis*; these are now present in the BMNH collection. I have chosen as lectotype the specimen bearing Ruthe's handwritten labels 'P. albicornis m.' and '6.10.55' which has previously been labelled as type of the species (3C 753).

♀. Antennae 32- to 33-segmented; thick, from about the fifteenth the apical segments of the flagellum are quadrate or even a little broader than long. Head strongly contracted behind eyes; temples about equal in length to eyes in dorsal view; frons depressed so that antennae are set upon a shelf, the antennal sockets surrounded by concentric rugae which sometimes extend down onto the face. Ocelli large, OO = 1.5 times OD. Eyes small, not convergent (Fig. 54). Malar space long, almost twice basal breadth of mandible. Face protuberant, punctate, sometimes reticulate-punctate laterally. Clypeus strongly protuberant, polished, punctate, narrower than face. Tentorial pits deep. Mandibles slender; strongly twisted with, at base of teeth, a

small but distinct tubercle-like swelling which terminates the ventral longitudinal carina of the mandible. Notaulices deep, narrow, foveolate. Sternaulus deep, broad, reticulate-rugose or sometimes foveolate with scattered rugae and foveae beneath. Propodeum strongly reticulate-rugose with no distinct longitudinal carinae but generally with a basal transverse carina and sometimes with a medial transverse carina which divides the dorsal and posterior faces of the propodeum, the latter generally concave. Tergite one short, wide, with distinct dorsal pits, dorsal surface strongly longitudinally striate. Ovipositor short, at most equal in length to tergite one; thick at base, tapering to apex, down-curved. Legs thick, hind tibia swollen, only slightly less broad than femur; hind coxa strongly sculptured, usually reticulate-rugose; tarsal claws strongly curved, without a basal lobe but strongly thickened at base. Wings infumate, short, the second abscissa of the radius short so that the second submarginal cell is strongly narrowed anteriorly even occasionally triangular.

Colour: antennae marked with a band of pale yellow which usually covers the basal half of the flagellum but is sometimes restricted to the middle segments; head, thorax and tergite one piceous, remaining tergites and legs testaceous.

♂. Same as female except that the antennae are longer, 32- to 36-segmented, all segments of the flagellum are distinctly longer than broad; there is never a pale band on the flagellum though the basal segments may be slightly lighter in colour than the rest; colour slightly darker; hind tibia less strongly swollen; punctures on face smaller so that the face appears smoother and shinier.

MATERIAL EXAMINED

170 ♂, 9 ♀. France, Germany, Great Britain, Hungary, Ireland, Netherlands, Sardinia, Sweden.

HOST. I have examined no reared material of this species. It has frequently been reported as a parasite of *Scolytus multistriatus* (Marsham) (Coleoptera: Scolytidae).

REMARKS. The darker parts of this species are dense pitchy black in freshly caught specimens; in older specimens this colour seems lighter and more reddish. Specimens from Ruthe's collection have all faded to red while a few of the specimens collected in Sweden in 1938 by Perkins are distinctly reddish and most show some evidence of such a change. The pale-banded antennae and the extremely short ovipositor at once distinguish the female of *consimilis* from all other European species of *Meteorus*. The shape of the head is also most characteristic in both sexes.

Meteorus corax Marshall

(Figs 10, 11, 14)

Meteorus corax Marshall, 1898: 220. LECTOTYPE ♀, SWITZERLAND: 'Val Somvix/25.vii.1891/Marshall det.' (NMB, Berne), here designated [examined].

Meteorus monochami Fischer, 1957c: 17. Holotype ♀. AUSTRIA: Lunz (*Haberfelner*), ex *Monochamus saltuarius* Gebl. (ZSBS, Munich) [not examined]. [Synonymized by Fischer, 1966: 395.]

Marshall stated that he had five specimens before him when describing *corax*, three from Lunz, Austria (Konow collection) and two from Val Somvix, Switzerland. The Konow collection is now housed in Eberswalde and there is in that collection a series of six specimens standing above the name *Meteorus corax*; each of these specimens bears a label 'Col. Konow' and five of them are labelled 'Lunz'. It is not now possible to distinguish Marshall's three syntypes from amongst these six specimens nor is it possible therefore to select a lectotype or paralectotypes from them. Marshall gave the depository for the Swiss specimens of *corax* as the 'Musée National de Berne' but there has never been an institution so entitled (Volkart, *in litt.*). In the collection of the NMB, Berne, however, there are three specimens standing above the name *Meteorus corax*, all with locality labels which bear the data published by Marshall and two of them also labelled 'Marshall det'. I believe the two latter specimens to belong to the syntype-series of *corax* and that Marshall misquoted the name of the depository. The six Konow specimens are conspecific with those in Berne and all agree closely with the description of *corax* except that they all have large distinct dorsal pits whereas Marshall states 'Premier segment de l'abdomen sans rainures trachéales'. I believe that the evidence for the identity of *corax* given above is sufficient to allow this statement to be discounted as being erroneous. I have examined a paratype of *monochami* and it is clearly conspecific with *corax*, as pointed out by Fischer.

♀. Antennae 39- to 41-segmented, long, all segments at least 1.5 times as long as broad. Head expanded behind the eyes, rather square in face view. Ocelli small, OO about 3 times OD. Eyes small, converging only

very slightly. Face about twice as long as broad. Clypeus distinctly narrower than face; protuberant; dorsal surface smooth and punctate; ventral surface strongly carunculate. Tentorial pits wide and deep. Mandibles very stout, twisted, with striate-punctate sculpture and long hairs. Pronotum strongly rugose, becoming reticulate-foveolate posteriorly. Mesonotum punctate; notaulices slender but distinctly impressed, foveolate. Sternaulus deep, foveolate with, anteriorly, a reticulate-foveolate patch beneath, rest of mesopleurae smooth, punctate except for a reticulate-rugose patch dorsally. Propodeum strongly reticulate-rugose with basal and medial transverse carinae; medial carina extremely prominent, dividing the propodeum into dorsal and posterior planes; there is also usually a rather indistinct central longitudinal carina. Tergite one with longitudinal strigose sculpture laterally, reticulate-rugose centrally; spiracles distinctly before the middle; large dorsal pits present, borders of tergite one not meeting beneath. Tergite two longitudinally striate, becoming reticulate-rugose basally; thyridia present at about mid-point of tergite; laterotergites large. The ovipositor about 4 times length of tergite one. Outer surface of hind coxa and femur densely reticulate-punctate; hind tibia strongly swollen though not as wide as femur; tarsal claws large, strongly curved, not lobed but strongly swollen at base. Second submarginal cell as high exteriorly as wide anteriorly (Fig. 14).

Colour black, foreleg usually and midleg sometimes testaceous, hind leg always black except for an ivory band around base of tibia.

♂. No material examined.

MATERIAL EXAMINED

27 ♀ **Austria**: 1 ♀, Lunz (*Haberfelner*) 'aus Monocham. saltuarius' (ZSBS München) (paratype of *Meteorus monochami* Fischer); 5 ♀, Lunz 'Konow coll.' (IP, Eberswalde); 1 ♀, 'Konow coll.' (IP, Eberswalde). **Germany**: 'Parasit von *Mon. sartor* F.', no other data (EH, Munich), **Sweden**: 18 ♀, Dlr. Rättvik, Mun. Samh. t. (*Tjeder*) (5 in BMNH, rest in NR, Stockholm). **Switzerland**: 1 ♀, Val Somvix, 25.vii.1891, 'Marshall det.' (NMB, Berne) (paralectotype of *Meteorus corax* Marshall); 1 ♀, Val Somvix, 25.vii.1891 (NMB, Berne).

HOSTS. *M. corax* has been recorded from two species of *Monochamus* Guérin-Ménéville (Coleoptera: Cerambycidae). The possession of a long ovipositor is often correlated with the use of wood-boring larvae as hosts.

REMARKS. This is the largest species of *Meteorus*, at least in the Palearctic region, averaging about 9.0 mm in head and body length. It is exceptionally dark in colour, the legs generally largely black.

Meteorus eadyi sp. n.

(Fig. 3)

♀. Antennae 26- to 27-segmented, all segments at least twice as long as broad. Head rounded behind eyes. Ocelli small, OO = 2.5–3.0 times OD. Eyes small, protuberant, not strongly convergent (Fig. 3). Face about 1.5 times as broad as high; punctate, usually with transverse rugae beneath antennal sockets. Clypeus not strongly protuberant, smooth with sparse punctures; the apical border produced laterally into a small flange (Fig. 3). Mandible not twisted, polished, the upper tooth rather long. Pronotum expanded forwards so that it projects beyond the mesonotum; smooth laterally with coarse rugae dorsally. Notaulices thin, foveolate. Sternaulus foveolate, rest of mesopleurae polished, punctate. Propodeum with three longitudinal and two transverse carinae with scattered rugae between. Tergite one long, slender, about twice as long as apically broad; without dorsal pits; spiracles distinctly behind the middle; borders of tergite one conjoined beneath from just behind the base of the segment to just in front of the spiracles; dorsally the tergite rugose or reticulate-rugose with longitudinal striae laterally, particularly in apical half of segment. Ovipositor short, about 1.5 times as long as tergite one, down-curved. Legs slender, hind coxae rugose, at least on the outer surface at the base; tarsal claws without a basal lobe.

Colour black; clypeus, pronotum ventrally and legs testaceous, basal segments of the antennae usually slightly lighter than the rest.

♂. Same as ♀ except that the eyes are smaller and less convergent.

MATERIAL EXAMINED

35 ♀, 2 ♂. Holotype ♀, **Great Britain**: Northamptonshire, Spratton, x.1975 (*Gauld*) (BMNH). Paratypes. **Bulgaria**: 1 ♀, Rhodopi, Markovo, 13.viii.1977 (*Zaykov*) (ZC, Plovdiv). **Great Britain**: 17 ♀, 1 ♂, England, Northamptonshire, Spratton, v.-x.1975 (*Gauld*) 1 ♀, E., Oxfordshire, Waterferry Common, 5.viii.1969 (*Brock*) (BMNH); 1 ♀, E., Greater London, Kew, 22.vii.1979 (*Eastop*) (BMNH). **Germany (West)**: 1 ♀, Bonn, Waldhauhofenweg, 18.xi.1960 (*Schmidt*) (CNC, Ottawa). **Netherlands**: 6 ♀,

Wijster (opp. biol. station); 3, 13–26.viii.1973; 1, 7–14.vii.1974; 1, 10–17.ix.1976; 1, 16–23.vi.1978 (*van Achterberg*) (RNH, Leiden); 7 ♀, Waarder (ZH), Oosteinde; 1, 1–15.ix.1973; 1, 17–22.vi.1974; 1, 1–5.viii.1974; 2, 1–6.ix.1974; 1, 15–22.vi.1975; 1, 21–31.x.1975 (*van Achterberg*) (RNH, Leiden); 1 ♀, Ede, 15.ix.1970 (*Zwakhals*) (RNH, Leiden). **Yugoslavia:** 1 ♀, Plitvice, 4–10.vii.1955 (*Coe*) (BMNH).

Non-paratypic material. **France:** 1 ♀, Chartrettes, 26.viii.1949 (*Granger*) (MNHN, Paris). **Great Britain:** 1 ♂, Wales, MM, Govilon, Marshall coll. (BMNH).

HOSTS. No reared material examined.

REMARKS. The structure of the thorax, of the propodeum and of tergite one show this species to be very closely related to *filator* with which it has often been confused in collections. *M. eadyi* can be distinguished, however, by its smaller, less convergent eyes, by the form of its clypeus and of its antennae and by its shorter ovipositor.

Haliday (1835: 33) noted the similarity between his species *filator* and *delator*. The close resemblance to *filator* of the species here described at first led me to suppose that it might be *delator*, which has never been adequately interpreted. In the description of *delator*, however, it is clearly stated that the ovipositor is as long as the abdomen [gaster] which is certainly never the case in *eadyi*.

Meteorus filator (Haliday)

(Figs 2, 7)

Perilitus (Meteorus) filator Haliday, 1835: 32. Holotype ♀, IRELAND: 'British Haliday 20.2.82' (NMI, Dublin) [examined].

Perilitus laticeps Wesmael, 1835: 47. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Considered valid species by Fischer, 1970a.] **Syn. n.**

Meteorus hodisensis Fischer, 1970b: 285. Holotype ♀, AUSTRIA: 'Bgl., Markt. hodis, Rechnitz, 7.viii.1961' (*Fischer*) (NHM, Vienna) [examined]. **Syn. n.**

The only specimen of this species in the Haliday collection is that labelled as '♀ type' by Stelfox in 1948. I therefore regard it as the holotype. The specimen is glued onto a rectangular piece of card and is in an excellent state of preservation but is rather dirty.

As pointed out by Fischer (1970a) there are two broken specimens in Wesmael's collection which are labelled 'Perilitus laticeps mihi' in Wesmael's handwriting. Neither of the specimens has a head but glued to the label of one of them is the head which was illustrated by Fischer (1970a: 53) in his redescription of *laticeps*. Largely on the basis of this head Fischer lifted *laticeps* from synonymy with *filator*, where it had been placed by Marshall (1887: 121). The head on the label does not agree, however, with what Wesmael (1835: 47) said about the head of *laticeps* and I consider it to have been mistakenly associated with the specimen on the pin. The parts of the specimen which remain on the pin are without doubt conspecific with *filator*, the head glued to the label is that of a male *consimilis*. I consider Marshall's synonymy of the two species further evidence in support of my view; Marshall had examined Wesmael's collection and he also knew *filator* and so gross a difference as that presented by the misassociated head is unlikely to have escaped his notice. Fischer also stated that one of the specimens possessed a gaster; this is unfortunately no longer present. The holotype of *hodisensis* falls within the range of variation of *filator*.

♀. Antennae 21- to 25-segmented, short; first two flagellar segments about 3 times as long as broad, five preapical segments only slightly longer than broad, submoniliform. Head broad, temples rounded. Ocelli small, OO=2.5–3.0 times OD. Eyes large, strongly convergent (Fig. 2). Face about as wide as high, not strongly protuberant, rugose, at least centrally, sometimes punctate laterally. Clypeus wide, polished, sparsely punctate, not strongly protuberant. Malar space short, distinctly less than half the basal breadth of mandible. Mandible large, not twisted. Pronotum projects forwards beyond the mesonotum and is slightly expanded sideways, strongly rugose. Mesonotum short, smooth; notaulices deep thin foveolate furrows. Sternaulus wide, foveolate, often with scattered rugae and foveae above and beneath; sculpture occasionally obsolescent. Propodeum rather depressed with two transverse and three longitudinal carinae, rugose between. Tergite one long, almost equal in length to rest of gaster, slender, 2.0–2.5 times as long as apically broad, ventral edges conjoined from near base of segment to its midpoint (Fig. 7), rugose dorsally with laterally in the apical half of the segment a longitudinal striate element which occasionally replaces the medial rugosity;

spiracles distinctly shortly behind mid-segment. Ovipositor long, 2.5 times length of tergite one. Legs long, slender; hind coxa reticulate-rugose, at least dorso-laterally; tarsal claws simple, long, slightly swollen at base. Wings large with a faint brown tinge; recurrent antefurcal, rarely interstitial.

Colour black except base of antennae, clypeus, mandibles, palpi, anterior margin of pronotum and legs yellow; hind coxa usually darker, at least in part, and rest of hind leg may be infuscated. Antennae and face occasionally completely yellow; in these lighter coloured specimens the pronotum is more extensively yellow though never completely so. I have seen one specimen in which the normally black parts of the body are deep reddish brown; this is probably an artefact such as is not uncommon in black insects which have been exposed overlong to cyanide in a killing bottle.

♂. Like the ♀ except eyes are smaller and less convergent so that the face is about twice as broad as high and the malar space longer; antennae longer, 27- to 30-segmented, all segments of flagellum at least twice as long as broad, darker in colour, rarely distinctly yellow in basal half of flagellum.

MATERIAL EXAMINED

130 ♀, 40 ♂. **Austria, Bulgaria, France, Germany, Great Britain, Ireland, Italy, Netherlands, Norway, Sweden.**

HOSTS. No reared material examined.

REMARKS. The characteristic first segment of the gaster, the shape and size of the eyes and of the antennal segments at once distinguish *filator* from all other species.

*Meteorus graciliventr*s Muesebeck

(Figs 46, 47)

*Meteorus graciliventr*s Muesebeck, 1954: 62. Holotype ♀, JAPAN: Chosen (USNM, Washington, 62029) [not examined].

Through the courtesy of Dr P. M. Marsh I have been able to examine seven female paratypes of this species.

♀. Antennae 31- to 33-segmented, the penultimate six or so segments not much longer than broad. Head strongly narrowed behind the eyes, the temples short, the eyes at least four times the length of the temple. Ocelli large, OO 1.25-1.50 times OD. Eyes very large, protuberant, strongly convergent so that the malar space is almost obliterated. Frons and vertex densely, regularly punctured. Face distinctly higher than wide, reticulate-punctate with some rugosity beneath the antennal sockets. Clypeus not strongly protuberant, smooth, with scattered large punctures. Tentorial pits small, very close to eye margin. Mandibles small, moderately twisted. Pronotum laterally coarsely rugose except for a polished punctate area dorsally. Sternaulus deeply impressed, foveolate, broadened anteriorly by a patch of reticulate-foveolate sculpture on the mesopleurae beneath the sternaulus, rest of mesopleurae shining punctate except for a subalar patch of rugosity. Propodeum broad, coarsely rugose, the carinae not distinctly differentiated. Tergite one long, slender, with dorsal pits, coarsely striate laterally and with a median longitudinal rugulose band. Ovipositor 3 times length of tergite one. Hind coxae strongly sculptured, usually reticulate-rugose; tarsal claws not strongly curved and with a small, inconspicuous basal lobe. Colour black; antennae, mandibles, palps, tergite two and legs testaceous except for the hind coxa, femur and tarsus distally which are infuscated.

♂. No material examined.

MATERIAL EXAMINED

Japan: 7 ♀, Yokohama, vii.1939, paratypes of *Meteorus graciliventr*s Muesebeck (USNM, Washington).

HOST. *Pectinophora gossypiella* Saunders (Lepidoptera: Gelechiidae).

REMARKS. The singular thing about *graciliventr*s is that the paratypes are the progeny of the holotype, having been bred in the laboratory in *Ephestia cautella* (Walker) (Lepidoptera: Pyralidae).

Meteorus gyrator (Thunberg)

(Fig. 56)

Ichneumon gyrator Thunberg, 1822: 261. Holotype ♂, SWEDEN (UDE, Uppsala) [examined].

Perilitus scutellator Nees von Esenbeck, 1834: 38. Syntypes ♂ ♀, GERMANY (lost). [Synonymized by Roman, 1912: 289.]

[*Meteorus melanostictus* Capron in Marshall, 1887: 115. Males only from type-series.]

Meteorus parvulus Thomson, 1895: 2156. Holotype ♀, SWEDEN: Öland (ZI, Lund) [examined]. **Syn. n.**

There is a single specimen of *gyrator* in Thunberg's collection and, although it is in poor condition, it is readily identifiable. I regard this specimen as the holotype of the species. There is a single specimen in Thomson's collection standing above the name *parvulus* which agrees with Thomson's description of that species and which is labelled 'Ö' (= Öland, the type-locality). I regard this specimen as the holotype of *parvulus*; it is rather smaller than the average specimen of *gyrator* but has all the structural features of that species and I have no doubt that the two are conspecific.

♀. Antennae long, 30- to 33-segmented, at most the two penultimate segments of the flagellum less than twice as long as broad. Head always contracted behind eyes, occasionally strongly rounded; temple always at least a little shorter than eye in dorsal view, eye never more than twice as long as temple. Frons with a short, shallow depression in front of fore ocellus. Ocelli large, OO = 1.0–1.5 times OD (exceptionally OO = 2 times OD). Eyes large, protuberant, generally but little convergent. Malar space a little less than basal breadth of mandible. Face generally a little broader than high, moderately protuberant, densely punctate, even reticulate-punctate, sometimes with some rugosity medially. Clypeus strongly protuberant, densely punctate, divided from the face by a deep fold. Mandibles long, strongly twisted. Pronotum projecting a little in front of the mesonotum, laterally rugose though this is occasionally largely obsolescent. Notaulices anteriorly broad, reticulate-rugose, coalescing posteriorly into a broad reticulate-rugose area which is rather depressed below the level of the lateral lobes of the mesonotum; rest of mesonotum polished, densely punctate, sometimes with a weak rugulose element, particularly on the lateral lobes. Sternaulus narrow, foveolate, occasionally broadened anteriorly by reticulate-foveolate patch beneath and, occasionally, with some rugae; rest of mesopleurae smooth with minute punctures except for a rugose area beneath the subalar prominence. Propodeum broad, generally rather flat, densely but finely rugose, sometimes reticulate-rugose with a central longitudinal carina which is sometimes weak and occasionally broken but always present, at least in part; the rugosity is occasionally coarse but is then sparse and not reticulate. Tergite one with distinct dorsal pits; dorsal surface strongly striate; lateral surface rugose at base, striate apically; glymmae shallow. Ovipositor short, 1.5–2.0 times length of tergite one, thick, strongly swollen at base. Legs long, thin; hind coxa smooth, punctate, often with a trace of weak rugosity laterally, occasionally with stronger rugosity dorsally, but never strongly reticulate-rugose. Tarsal claws always with a basal lobe but this is often difficult to see because the claws are rather small and often partly buried in the hair of the apical tarsal segment. Wings never infumate, even in the darkest-bodied specimens; the pterostigma always uniformly pale testaceous.

Colour black; face, clypeus, genae anteriorly, vertex laterally, thorax ventrally, scutellum and tergites 2 and 3 orange-testaceous, legs yellow; few darker specimens occur and I have seen none in which the scutellum is not light in colour; completely testaceous specimens are not uncommon and all intermediate patterns occur.

♂. Same as ♀ except eyes smaller and malar space longer; propodeum often more coarsely sculptured; colour often darker, the pterostigma generally dark, often with a pale border.

MATERIAL EXAMINED

220 ♀, 201 ♂. **Austria, Bulgaria, Cyprus, Finland, France, Germany, Great Britain, Hungary, Ireland, Netherlands, Sweden.**

HOSTS. *Lycophotia porphyrea* (Denis & Schiffermüller), *Diarsia brunnea* (Denis & Schiffermüller), *Ipimorpha retusa* (L.), *Xestia xanthographa* (Denis & Schiffermüller), *Mythimna* sp., *Lacanobia oleracea* (L.), *Agrochola lota* (Clerck), *Euplexia lucipara* (L.), *Cosmia trapezina* (L.), *Thalpophila matura* (Hufnagel), *Cleoceris viminalis* (Fabricius) (Lepidoptera: Noctuidae).

REMARKS. *M. gyrator* is superficially similar to *pulchricornis*, being similar in stature and in colour. The clypeus of *gyrator*, however, is shining with scattered punctures and hairs, quite unlike that of *pulchricornis*; *gyrator* also has a deeply impressed, narrow, foveolate sternaulus (whereas that of *pulchricornis* is shallow rugose), a more depressed and generally more finely rugose propodeum and a uniformly pale stigma, at least in the female (the stigma in *pulchricornis* is dark and pale-bordered).

Meteorus heliophilus Fischer

(Figs 32, 33)

Meteorus heliophilus Fischer, 1970b: 284. Holotype ♀ AUSTRIA: Burgenland, Rechnitz, 2.viii.1958 (Fischer) (NM, Vienna) [examined].

Among Ruthe's material of *luridus* two specimens stand which are quite distinct from the other specimens of that species. One of these specimens bears a label '*pallidus*' in Ruthe's handwriting and I take this to indicate that Ruthe considered this specimen to be his var. *pallida* of *luridus*. These two specimens of Ruthe's are clearly conspecific with *heliophilus* which is the species misidentified as *luridus* Ruthe by Marshall (1887), by Lyle (1914) and by Tobias (1976).

♀. Antennae long 30- to 32-segmented, all segments of flagellum clearly much longer than broad. Head strongly contracted behind eyes. Eye in dorsal view 2.5-3.0 times as long as temple. Ocelli large, OO=1.0-1.5 times OD. Eyes large, protuberant, not strongly convergent. Malar space short, less than half basal breadth of mandible. Face about as broad as high, not strongly protuberant, slightly raised medially where it is transversely rugose, laterally punctate. Clypeus protuberant though not strongly so, smooth with scattered coarse punctures. Tentorial pits small, indistinct. Mandibles strongly twisted, the upper tooth not conspicuously long. Pronotum laterally smooth with a little fine rugose sculpture medially. Mesonotum punctate, sometimes the central lobe reticulate-punctate, at least in part; notaulices weakly impressed. Sternaulus weakly rugose, sometimes obsolescent posteriorly. Propodeum shining with weak carinae and weak, largely obsolescent rugae dorsally. Tergite one long, slender, ventral borders meeting beneath at the mid-part of the segment, not joined at the base of the segment; dorsal surface weakly longitudinally striate; no glymmae or dorsal pits. Ovipositor about twice length of tergite one, thick, strongly expanded at the base and the apical sixth much narrowed. Legs long, slender; hind coxa mainly smooth but sometimes with a trace of rugosity dorsally. Tarsal claws with a distinct basal lobe.

Colour testaceous, the legs generally a paler shade of yellow.

♂. Same as ♀ except antennae 31- to 33-segmented.

MATERIAL EXAMINED

34 ♀, 21 ♂. **Bulgaria:** 1 ♀, Rhodopi, Velingrad, 20.x.1977 (*Zaykov*) (ZC, Plovdiv). **Germany:** 4 ♀, Harz, 27.iv.1957 (*Hinz*), ex *Agrotis triangulum* (BMNH); 2 ♀, Ruthe coll. (BMNH). **Great Britain:** 27 ♀, 19 ♂, England, Hampshire, New Forest (*Lyle*) (BMNH).

HOSTS. *Polia nebulosa* (Hufnagel), *Lithophane ornitopus* (Hufnagel), *Noctua fimbriata* (Schreber), *Xestia triangulum* (Hufnagel), *Orthosia stabilis* (Denis & Schiffermüller) (Lepidoptera: Noctuidae). Both Lyle (1914) and Tobias (1976) recorded this species as being gregarious, several parasite larvae developing in one host caterpillar.

REMARKS. *M. heliophilus* is structurally very close to *lionotus* but the differences in head shape between the two species together with the characteristics given in the key to species amply distinguish them. The two species also have a different host-spectrum and *heliophilus* is gregarious and *lionotus* solitary. *M. heliophilus* is also close to *rubens* and shares the latter's gregarious habit and use of noctuids as hosts. *M. rubens*, however, has shorter antennae, smaller eyes and ocelli and less strongly contracted temples than *heliophilus*. The three species are clearly closely related.

Meteorus hirsutipes sp. n.

(Figs 25, 28, 29, 35)

♀. Antennae 28- to 30-segmented, thin, all flagellar segments longer than broad, the three basal ones at least 3 times as long as broad. Head strongly narrowed behind eyes, temples distinctly shorter than eyes in dorsal view; occiput concave. Ocelli small, OO=3 times OD. Eyes protuberant, slightly convergent. Face about twice as broad as high, not strongly protuberant. Clypeus not strongly protuberant, as broad as face, punctate. Mandible very large, stout and not twisted. Prothorax projecting before the mesonotum with strong vertical rugae laterally. Mesonotum polished with fine punctures; notaulices deep, narrow, foveolate. Sternaulus deep, foveolate, angled sharply upwards in its anterior half; rest of mesopleurae polished, punctured. Propodeum with strong longitudinal and transverse carinae with a few weak rugae between, posteriorly with strong, mainly vertical rugae. Tergite one with coarse longitudinal striae, the innermost striae turn inwards posteriorly and join to form a transverse rugose area; medial part of tergite anteriorly reticulate-rugose. Ovipositor 2.5 times length of tergite one, straight. Hind coxa punctate or reticulate-punctate; tarsi with long hairs the longest of which at the apices of the tarsal segments are at least twice the maximum breadth of the segment. Tarsal claws simple, very long, sickle-shaped.

Colour black, prothorax and legs testaceous.

♂. No material examined.

MATERIAL EXAMINED

3 ♀. Holotype ♀, **Finland**: Valamo, Ladoga, NE. of monastery Hainwald 24.viii.1935 (*Kerrich*) (BMNH).
Paratypes. **Germany (West)**: 1 ♀, Bavaria, Schliersee, 28.vii.1958 (*Townes*) (CNC, Ottawa). **Ireland**: 1 ♀, Co. Wicklow, Deputy's Pass, 7.viii.1932 (*Stelfox*) (USNM, Washington).

HOSTS. No reared material examined.

REMARKS. This species is extremely close to *brevicauda*. The main differences between them are those cited in the key to species; the hairs of the hind tarsi also differ, those of *brevicauda* being much shorter, the longest hairs at most equal in length to the maximum breadth of the tarsi.

Meteorus ictericus (Nees von Esenbeck)

(Figs 52, 53)

Bracon ictericus Nees von Esenbeck, 1811: 22. Syntype(s) ♀, GERMANY (destroyed).

Ichneumon minor Thunberg, 1822: 266. Holotype ♀ (UDE, Uppsala) [examined]. [Synonymized by Roman, 1912: 267.]

Zele ephippium Curtis, 1832: folio 415. Syntypes, GREAT BRITAIN: 'Coomb Wood' (NMV, Melbourne) [not examined]. [Synonymized by Curtis, 1837.]

Perilitus xanthomelas Wesmael, 1835: 29. LECTOTYPE ♂, BELGIUM: Brussels (IRSNB, Brussels), here designated [examined]. [Synonymized by Fischer, 1970b: 263.]

Meteorus confinis Ruthe, 1862: 18. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus fallax Ruthe, 1862: 18. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus pleuralis Ruthe, 1862: 19. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus liquis Ruthe, 1862: 20. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus consors Ruthe, 1862: 44. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. [Synonymized by Fischer, 1970b: 263.]

Meteorus crassicus Thomson, 1895: 2154. LECTOTYPE ♀, SWEDEN: Skåne, Arrie (ZI, Lund), here designated [examined]. **Syn. n.**

Meteorus lophyrphagus Fahringer in Schönwiese, 1934: 495. Holotype ♀, AUSTRIA (IFF, Vienna) [examined]. **Syn. n.**

Meteorus adoxophyesi Minamikawa, 1954: 41. Holotype ♀, JAPAN: Kanaya Shizuoka-ken, 10.iv.1948 (*Sonan*) (NIAS, Yatabe) [examined]. **Syn. n.**

There is one specimen standing above the label 'minor' in Thunberg's collection. It is in a reasonably good state of preservation and is clearly within the limits of variation of *ictericus*. The specimen is labelled 'Meteorus minor Thbg.' in Roman's handwriting.

I have based my interpretation of *ephippium* Curtis on a specimen labelled 'Met. (Zele) ephippium C. com. w. type' by G. E. J. Nixon who examined the Curtis collection in 1948. Nixon chose a 'type-specimen' for *ephippium* but never validated his selection by publication.

Wesmael stated that he had two males of *xanthomelas*. One male and one female presently stand in his collection above this name, both of them labelled 'Perilitus xanthomelas mihi' in Wesmael's handwriting. The female clearly cannot be part of the syntype-series and I have therefore chosen the male as lectotype.

Ruthe stated that he possessed two females of *confinis*; these are present in the collection of the BMNH. I have selected as lectotype the specimen bearing Ruthe's label 'P. confinis m.'

Ruthe stated also that he possessed two females of *fallax*, these are present in the collection of the BMNH and I have selected as lectotype the specimen bearing a label 'P. fallax m.' in Ruthe's handwriting.

Ruthe did not state what material he had of *pleuralis* or of *liquis*. There is one specimen of each of these species in the BMNH, each bearing a label in Ruthe's handwriting; I have designated these specimens as lectotypes of their respective species.

There are four conspecific specimens standing above the name 'consors' in Ruthe's collection. I have selected as lectotype the specimen which bears a label 'P. consors m.' in Ruthe's handwriting.

Four conspecific female specimens stand above the name 'crassicus' in Thomson's collection. Two of them bear a label 'ar' [=Arrie i Skåne, one of the published localities]; one of these specimens also bears a label 'crassicus' in Thomson's handwriting. I have chosen the latter specimen as lectotype of *crassicus* and the second specimen from Arrie, labelled paratype by Fischer, as paralectotype.

Fahringer stated that he possessed one female of *lophyriphagus*. This specimen, a photograph of which appears in Schönwiese (1934: 496), stands in the collection of the Universität für Bodenkultur, Vienna. It bears a label 'Meteorus lophyriphagus n. sp. Type' in Fahringer's handwriting and a second label 'Rinkenbergl., 25.7.32, ex Loph. sif.'. It is well within the limits of variation of *ictericus*.

Minamikawa, in his description of *adoxophyesi*, stated that tergite one was about three times as long as apically broad and that the tracheal grooves [dorsal pits] were obsolete. These points in the description certainly do not agree with what is to be observed on the holotype in which tergite one is twice as long as apically broad and dorsal pits are present. Thus *adoxophyesi* comes within the limits of variation of *ictericus*. Minamikawa formerly used the name *Sonan* under which name he cited himself as the author of *Meteorus adoxophyesi* (1954: 43). Since the paper in which this species was described appeared under the authorship of Minamikawa I have used this name in citing authorship of *adoxophyesi*, as did Shenefelt (1969: 50).

♀. Antennae 26- to 33-segmented, long, all segments at least slightly longer than broad. Head strongly contracted behind the eyes (Fig. 53), generally not strongly rounded; length of eyes 2.5–3.0 times length of temple in dorsal view. Ocelli large, $OO=1.0-1.5$ times OD , protuberant, the ocellar area distinctly raised. Eyes large, protuberant inner margins converging (Fig. 52) but never strongly so. Malar space short, at most equal to half basal breadth of mandible. Face not strongly protuberant but often slightly raised medially, polished, finely punctate. Clypeus narrower than face, protuberant, polished, sparsely punctate, the ventral border often broadly and shallowly emarginate. Tentorial pits small, indistinct. Mandibles moderately twisted, short but fairly stout. Pronotum laterally smooth, punctate. Notaulices deeply impressed, foveolate. Sternaulices foveolate, narrow, often at least partly obsolescent; rest of mesopleuron polished, finely punctate. Propodeal carinae weakly developed except for the medial transverse carina which is strongly raised, at least centrally; propodeum dorsally polished with a few obsolescent rugae between the carinae, the rugose sculpture sometimes rather stronger and occasionally reticulate-rugose though never strongly so. Tergite one long, slender with distinct dorsal pits and glymmae; dorsal surface striate. Ovipositor long, 2.5–3.0 times length of tergite one, stout, usually slightly down-curved at the apex. Legs long, slender; hind coxa polished and with fine puncturation, often reticulate-punctate ventrolaterally but never with distinct rugosity; hind tibia swollen, particularly in its apical half but not usually as broad as the femur; tarsal claws strongly bent and with a large basal lobe. Recurrent always antefurcal, usually markedly so but occasionally almost interstitial.

Colour black except head, prothorax, legs and pterostigma which are yellow, tergite two is often also yellow or at least lighter in colour than rest of gaster; head always yellow except sometimes for a dark patch on vertex around ocelli and occasionally extending back to the occipital carina, legs also generally yellow except that the apex of hind tibia and of the tarsal segments are infuscated. I have seen only one specimen of this species in which the head was almost completely dark and in this specimen the legs were also rather dark. Lighter-coloured specimens are not infrequent in occurrence; the thorax and gaster either in whole or in part may be reddish testaceous rather than black. Rarely specimens are found which are wholly reddish testaceous except for the ovipositor sheaths which are black.

♂. Same as ♀ except antennae longer.

MATERIAL EXAMINED

655 ♀, 14 ♂. Austria, Czechoslovakia, Finland, France, Germany, Great Britain, Hungary, Ireland, Japan, Netherlands, Sweden, Turkey.

HOSTS. *Archips podana* (Scopoli), *Epiphyas postvittana* (Walker), *Adoxophyes orana* (Fischer von Röslerstamm), *Adoxophyes privityana* (Walker), *Tortrix viridana* (L.), *Croesia bergmanniana* (L.), *Acleris hastiana* (L.), *Epinotia sordidana* (Hübner) (Lepidoptera: Tortricidae). *Neodiprion sertifer* (Geoffroy in Fourcroy) (Hymenoptera: Diprionidae).

REMARKS. *Meteorus ictericus* is a rather slender, conspicuously smooth species; it is rather similar in appearance to *obsoletus* from which it is easily distinguished by its possession of dorsal pits on tergite one.

I am by no means confident that I have adequately defined the specific limits of *ictericus* and of *pallipes*. The typical forms of the two species are fairly easily differentiated but small specimens quite frequently occur which are difficult to place. It may be that *ictericus* and *pallipes* as I have defined them comprise a complex of species which I am at present unable to separate, or there may only be a single large protean species. I am retaining them here as two distinct but closely related species. I have given *ictericus* rather broader limits than *pallipes* which I have restricted to the typical form. Included in the synonymy of *ictericus* are *confinis*, *fallax*, *pleuralis*, *liquis* and *crassicrus* although they are all smaller and lighter in colour than typical *ictericus*. Ruthe gave his four nominal taxa specific rank on the basis of their differences in colour from typical *ictericus* and on their shorter antennae. Colour differences are not a reliable basis for specific distinction and the differences in the antennae are only such as are to be expected in small specimens. Thomson differentiated *crassicrus* principally by its possession of a swollen hind tibia. In Thomson's original material, however, the hind tibia is not more swollen than in other specimens of *ictericus*. Although *crassicrus* is rather smaller and paler than typical specimens of *ictericus* it is otherwise within the limits of variation of that species.

Meteorus jaculator (Haliday)

(Fig. 15)

Perilitus (Meteorus) jaculator Haliday, 1835: 34. Syntypes ♀, IRELAND (lost).

Meteorus obscurellus Ruthe, 1862: 29. Holotype ♀, GERMANY: Ruthe coll. (BMNH) [examined].
[Synonymized by Marshall, 1887: 108.]

Meteorus tenuicornis Thomson, 1895: 2164. LECTOTYPE ♀, SWEDEN: Skåne, Palsjo (ZI, Lund), here designated [examined]. **Syn. n.**

There is no specimen of this species present in Haliday's collection; I have therefore based my interpretation of *jaculator* on specimens from Stelfox's comprehensive collection of Irish insects which Stelfox himself had named as *jaculator*. These specimens fit Haliday's description and I believe Stelfox's interpretation to be correct. There is one specimen of *obscurellus* in the BMNH collection; this specimen bears a label in Ruthe's handwriting 'P. obscurellus M.' and corresponds exactly with the description of that species. It is clearly conspecific with the insects I have interpreted as *jaculator*. There is one female specimen standing above the name *tenuicornis* in Thomson's collection, it is from the type-locality and agrees with Thomson's description of the species. This specimen has been labelled 'type' by Fischer; there is a second (male) specimen taken at Mölle.

♀. Antennae short, 18- to 26-segmented, slender, all segments of flagellum at least as long as broad. Head swollen behind eyes; temples longer than eyes (Fig. 15). Ocelli small, OO = 3-4 times OD. Eyes small, height of eye less than breadth of face; slightly convergent. Malar space at least slightly shorter than basal breadth of mandible. Face about twice as broad as high, protuberant, reticulate-punctate with some rugosity medially, occasionally entirely smooth and shining with minute punctures. Clypeus smooth, shining, with scattered large punctures, not strongly protuberant. Tentorial pits small but distinct. Mandibles stout, not strongly twisted. Pronotum projecting in front of mesonotum; laterally smooth and weakly rugose. Notaulices thin, foveolate. Sternaulus narrow, reticulate-foveolate with a few scattered rugae; rest of mesopleurae smooth, minutely punctured except for a large reticulate-foveolate area beneath the base of the forewing. Propodeum weakly rugose, the carinae weak but generally distinct, occasionally the rugosity is strong enough to obscure the carinae. Tergite one generally predominantly irregular reticulate-rugose with only a few striae laterally, occasionally the striae are predominant but usually then they are obsolescent; the medial longitudinal area of the tergite is strongly raised. Ovipositor 3-4 times length of tergite one. Hind coxa generally strongly rugose, occasionally weakly so. Tarsal claws short with no basal lobe.

Colour black; legs testaceous but sometimes the coxae darker; clypeus and mandibles often yellow.

♂. Same as ♀ except that the antennae much longer, up to 29-segmented, all flagellar segments conspicuously longer than broad.

MATERIAL EXAMINED

42 ♀, 1 ♂. **Bulgaria**: 1 ♀, Rhodopi, 23.viii.1977 (*Zaykov*) (ZC, Plovdiv). **Germany (West)**: 1 ♀, Hiedeck, Heidelb. (*Haeselbarth*) (EH, Munich). **Great Britain**: 12 ♀, England, Northamptonshire, Spratton, viii.1975 (*Gauld*) (BMNH); 1 ♀, E., Hertfordshire, Tring, 8.vi.1936 (*Benson*) (BMNH); 1 ♀, E., H., Bricket

Wood, 28.v.1937 (*Nixon*) (BMNH); 1 ♀, E., Cambridgeshire, Woodwalton, 21–23.v.1949 (*Benson*) (BMNH); 1 ♀, E., Dorset, Studland Heath, 6.vi.1938 (*Benson*) (BMNH); 1 ♀, E., Kent, Eynsford, 6.vi.1939 (*Nixon*) (BMNH); 1 ♀, E., Hereford and Worcester, Fownhope, Capler Wood, 31.v.1936 (*Perkins*) (BMNH); 1 ♀, E., H. and W., Fownhope, Pagets Wood, 1.vi.1936 (*Perkins*) (BMNH); 1 ♀, E., Devon, Torquay, 19.vi.1960 (*Vockeroth*) (CNC, Ottawa). **Ireland:** 1 ♂, Co. Dublin, B'Scorney, 15.vii.1945 (*Stelfox*) (USNM, Washington); 2 ♀, Co. Down, Tollymore Park, 27.viii.1961 and 17.ix.1961 (*Stelfox*) (USNM, Washington); 2 ♀, Co. Do., Dramahilly, 20. and 27.vii.1964 (*Stelfox*) (USNM, Washington); 1 ♀, Co. Do., Donnaird Lo., 17.x.1965 (*Stelfox*) (USNM, Washington); 5 ♀, Co. Sligo, Trawallua, 24–29.vi.1933 (*Nixon*) (BMNH). **Netherlands:** 2 ♀, Waarder, Oosteinde, vii. and ix.1974 (*van Achterberg*) (RNH, Leiden); 2 ♀, Wijster (Dr.) vi.-vii.1973 and vii.1977 (*van Achterberg*) (RNH, Leiden); 1 ♀, Oostvoorne, 15–20.v.1973 (*Van Achterberg*) (RNH, Leiden); 1 ♀, Meyendal near the Hague, Bierlap outer dunes, 18–25.vii.1974 (*van der Zon*) (RNH, Leiden); 1 ♀, Ede, 22–28.ix. (*van Rossem*) (RNH, Leiden); 1 ♀, Nunspeet, 1.x.1975 (*Zwackals*) (RNH, Leiden); 1 ♀, Wassenaar, 18.vii.1971 (*Pronk*) (RNH, Leiden). **Sweden:** 1 ♀, Upl., Vallentuna, 17.ix.1941 (*Hedqvist*) (HC, Stockholm).

HOSTS. No reared material examined. Van Burgst (1919: 105) recorded *jaculator* as a parasite of *Trichophaga tapetzella* L. (Lepidoptera: Tineidae). I have examined these specimens and found them to be *M. cespitator*.

Meteorus lionotus Thomson

(Figs 30, 31, 38, 40)

Meteorus lionotus Thomson, 1895: 2160. LECTOTYPE ♂, SWEDEN: Norland (ZI, Lund), here designated [examined].

Meteorus ruficoloratus Fischer, 1957b: 4. Holotype ♂, GERMANY (WEST): München, 15.vii.1884 (*Kriechbaumer*) (ZSBS, Munich) [examined]. **Syn. n.**

There are two specimens standing above the name *lionotus* in Thomson's collection. I have selected as lectotype a specimen labelled 'Norl.' (the type locality) in Thomson's handwriting; this specimen agrees precisely with the description of *lionotus*. The second specimen has evidently been misplaced and has no connection with *lionotus*.

I consider Fischer's placement of *ruficoloratus* near *ictericus* to be erroneous despite their common possession of short, strongly contracted temples. The holotype of *ruficoloratus* has only spurious pits on the dorsal surface of tergite one and the ventral borders of this tergite conjoined beneath at about the mid-point of the segment, and comes well within the limits of variation of *lionotus*.

♀. Antennae 31- to 33-segmented, long, most segments at least twice as long as broad. Head strongly contracted behind the eyes and the temples short, about one-third length of eye (Fig. 31). Ocelli very large, OO = 0.5 times OD, protuberant. Eyes a little broader than high, not strongly protuberant. Clypeus strongly protuberant. Mandibles strongly twisted, small, rather delicate. Thorax large, a little higher than long. Mesonotum smooth, weakly rugose-punctate; notalices weak, indistinct anteriorly. Sternaulus shallow, rugose, the sculpture often obsolete anteriorly and posteriorly; rest of mesopleurae polished, punctate. Propodeum generally depressed, usually with distinct carinae laterally and occasionally with a weak medial transverse carina; usually smooth, polished anteriorly but in some specimens this area is weakly rugose. Tergite one long with no dorsal pits; ventral borders conjoined at about mid point of segment; dorsal surface smooth at base and longitudinally striate apically though this is sometimes obsolescent. Ovipositor about 1.5 times length of tergite one. Legs long, slender; tarsal claws with strong basal lobe. Wings large, first abscissa of cu_1 longer than cua .

Colour testaceous, usually vertex around ocelli and occipital region black; sometimes propodeum, first tergite and apex of gaster dark, occasionally the whole body dark except for the legs which are always light in colour.

♂. Same as ♀ except that ocelli and eyes slightly smaller.

MATERIAL EXAMINED

30 ♀, 22 ♂. **Great Britain, Greece, Sweden.**

HOSTS. *Thera variata* (Denis & Schiffermüller), *Thera obeliscata* (Hübner) (Lepidoptera: Geometridae) on *Pinus* and *Thera juniperata* (L.) on *Juniperus*. In Great Britain the parasite has two generations in April/May and in September.

REMARKS. The extremely large ocelli and the short strongly contracted temples immediately distinguish *lionotus* from any closely related species. The shape of the thorax and the weakness of the sculpture are also characteristic of *lionotus*.

Meteorus longicaudis (Ratzeburg)

(Fig. 18)

Perilitus longicaudis Ratzeburg, 1848: 55. Syntypes ♀, GERMANY (destroyed).

I have followed Thomson's (1895) interpretation of this species which was based on specimens reared from the same host species as Ratzeburg's original material. The description of *longicaudis*, although short, is sufficient for the species to be identified with tolerable certainty.

♀. Antennae 29- to 32-segmented, flagellar segments all clearly longer than broad, flagellum gradually tapering to apex. Head broad, strongly rounded behind eyes. Ocelli small, OO=3 times OD. Eyes rather small, barely convergent. Malar space about equal to basal breadth of mandible. Face not strongly protuberant, about twice as broad as high, strongly punctate and, at least centrally, reticulate-punctate; vertex also punctate but frons centrally polished, impunctate. Clypeus moderately convex with scattered deep punctures and a broad polished reflexed border. Tentorial pits indistinct. Mandibles stout, slightly twisted. Pronotum rugose in its ventral half, polished dorsolaterally. Notaulices narrow but deeply impressed foveolate furrows. Sternaulus rugose, always broadened anteriorly into a reticulate-rugose area; rest of mesopleurae densely punctate and, dorsally, with a rugose area beneath the wing. Propodeum strongly rugose, the carinae strong but not easily seen. Tergite one very broad, length about 1.5 times apical breadth; dorsal pits large, distinct; dorsal surface finely striate laterally finely rugose medially. Ovipositor very long, 4-5 times length of tergite one. Legs long, hind coxa weakly rugose dorsally; tarsal claws simple but somewhat thickened at base, strongly curved.

Colour black; antennae, head, prothorax and legs orange-testaceous; the basal half of hind tibia lighter yellow, almost ivory; the head is sometimes infuscated, at least in part, and tergite two is often lighter in colour than rest of body.

♂. Same as ♀ except antennae longer, up to 36-segmented, all segments at least twice as long as broad; propodeum smaller; tergite one narrower.

MATERIAL EXAMINED

27 ♀, 4 ♂. **Netherlands:** 4 ♀, Well, 1978 (*Lefeber*) (RNH, Leiden); 1 ♀, Brisen Dantz (RNH, Leiden). **Sweden:** 5 ♀, Thomson coll. (ZI, Lund); 16 ♀, 4 ♂, SM. Hornsö, 28.v.-21.vi.1954 (*Lundblad*) (5 ♀ in BMNH, rest in NR, Stockholm); 1 ♀, Sk. His väderö, 29.iv.1973, ex *Eledenoprius armatus* Panzer (*Huggert*) (HC, Stockholm).

HOSTS. Type-material reared from *Orchesia micans* (Panzer) (Coleoptera: Melandryidae). Thomson's specimens of *longicaudis* which I have examined were reared from the same host-species. I have also examined a specimen reared from *Eledenoprius armatus* Panzer (Coleoptera: Tenebrionidae). The larvae of both these species of beetle live in bracket fungi on trees.

REMARKS. *M. longicaudis* most closely resembles *obfuscatus*, which also parasitizes *Orchesia micans*; *longicaudis* is easily distinguished from *obfuscatus* by its much longer ovipositor, rugose sternaulus and longer antennae. The males of the two species are more difficult to distinguish since the antennae of both are long and of course they lack ovipositors; the sculpture of the sternaulus is the principal means of separating them. *M. longicaudis* males generally also have slightly smaller eyes and ocelli and rugose hind coxae, the latter are smooth, punctate in *obfuscatus*. *M. longicaudis* also resembles *salicorniae* from which it may be distinguished by its longer ovipositor, by the shape of its head and by its strong facial puncturation.

Meteorus melanostictus Capron

(Fig. 57)

Meteorus melanostictus Capron in Marshall 1887: 115. Syntypes ♀, GREAT BRITAIN (lost).

Meteorus niger Lyle, 1913: 244. LECTOTYPE ♀, GREAT BRITAIN: England, Hampshire, New Forest, 13.v.1911 (*Lyle*), *H. syringaria* (BMNH), here designated [examined]. **Syn. n.**

I have been unable to locate any of Capron's specimens of *melanostictus*, I have therefore based my interpretation of this species on a female standing above the name *melanostictus* in Marshall's collection. This specimen agrees precisely with Capron's description. There are two males also from Marshall's collection placed with the female, one of them bearing a label 'melanostictus Capron' in Marshall's handwriting. These males are not conspecific with the female and I consider them to be melanic specimens of *M. gyrator*. These specimens do agree with Marshall's statements on what he evidently mistakenly considered to be the male of *melanostictus*. Lyle had completely the wrong concept of *melanostictus*, the specimens from his collection named as that species are *lionotus* and his description and host records for *melanostictus* also apply to *lionotus*. Lyle (1913) then described specimens of the true *melanostictus* as a new species, *niger*. There are four specimens (2 ♂, 2 ♀) of *niger* in Lyle's collection labelled 'type' by Lyle; I have selected the best-preserved female as lectotype.

♀. Antennae 25- to 26-segmented, all flagellar segments at least twice as long as broad. Head strongly contracted behind eyes, rather flat between ocelli and occipital carina; eyes in dorsal view about twice as long as temples; frons with a blunt tubercle medially, in front of the fore ocellus. Ocelli large, $OO = 1.0-1.5$ times OD. Eyes large, protuberant, moderately convergent. Malar space short, distinctly less than half the basal breadth of mandible. Face about as wide as high, not strongly protuberant, smooth, punctate, with some weak rugosity. Clypeus strongly protuberant with scattered large punctures. Tentorial pits deep. Mandibles strongly twisted. Pronotum projecting but little in front of the mesonotum, laterally smooth with a little rugosity medially. Notaulices thin, foveolate, coalescing posteriorly into a rugose area. Sternaulus thin, foveolate, often obsolete posteriorly; rest of mesopleurae smooth, punctate; subalar prominence strongly raised, carinate. Propodeum short, without distinct carinae except for a strongly raised medial transverse carina which divides the propodeum into dorsal and posterior faces, the sculpture rugose, generally weak and never reticulate. Tergite one rather stout with distinct dorsal pits and large glymmae; ventral borders of tergite widely separated; dorsal surface coarsely striate. Ovipositor short, about 1.5 times length of tergite one. Legs short; hind coxa smooth, punctate; tarsal claws with a distinct basal lobe.

Colour black; face, clypeus, orbits, genae, prothorax, tegulae and legs yellow.

♂. Same as female except for differences in terminalia.

MATERIAL EXAMINED

21 ♀, 6 ♂. **Great Britain:** 20 ♀, 6 ♂, England, Hampshire, New Forest (*Lyle*), ex *H. syringaria* (BMNH); 1 ♀, Marshall coll. (BMNH).

HOSTS. *Apeira syringaria* (L.), *Ennomos quercinaria* (Hufnagel) (Lepidoptera: Geometridae).

Meteorus micropterus (Haliday)

(Fig. 1)

Perilitus (Meteorus) micropterus Haliday, 1835: 27. LECTOTYPE ♀, IRELAND: 'British, Haliday, 20.2.82' (NMI, Dublin), here designated [examined].

I have chosen and labelled as lectotype the specimen selected as '♀ type' by Stelfox in 1948 (unpublished Ms). The specimen is glued on a rectangular piece of card and it is by far the best-preserved specimen of Haliday's material of this species. It agrees precisely with Haliday's description though it is rather faded in colour.

♀. Antennae 23- to 26-segmented, short, thick; segments obconical and except for the first four flagellar segments only as long as broad; only first segment of flagellum as much as twice as long as broad. Head with temples strongly rounded, rather square in face view. Ocelli small, $OO = 3$ times OD. Eyes small, inner orbits parallel; length of malar space at least equal to basal breadth of mandible. Face protuberant, punctate, projecting in front of frons which is depressed. Clypeus broad, smooth, punctured, distinctly divided from the face. Tentorial pits large, deep. Mandibles moderately twisted, large, stout. Pronotum slightly expanded, projecting strongly in front of and to the sides of the mesonotum, forming a 'collar'. Mesonotum rather narrow, closely punctate and very hairy. Mesopleurae mostly smooth with scattered punctures. Sternaulus foveolate. Propodeum reticulate-rugose, without distinct carinae. Tergite one smooth, shining, with obsolescent longitudinal striate sculpture posterolaterally; ventral borders fused beneath for at least the proximal half of the segment. Ovipositor twice length of tergite one, straight. Legs stout; hind coxae rugose dorsally; tarsal claws without a lobe but strongly swollen at base. Wings short, narrow, usually infumate.

Colour brownish black; legs testaceous, most usually with the hind coxa dark and frequently also the hind femur, often tergite two, sometimes side of pronotum and occasionally base of flagellum lighter in colour.

♂. Same as the ♀ except that eyes smaller; antennae 24- to 28-segmented, the segments longer, the flagellum distinctly thickened in its proximal half and gradually tapering to apex and the colour darker; mid and hind coxae usually darker, sometimes black, this colour change may also affect the rest of the mid and hind legs so that occasionally the mid and hind legs are almost completely black, only the tarsi retaining a lighter tinge.

MATERIAL EXAMINED

38 ♀, 46 ♂. **Germany, Great Britain, Ireland.**

HOSTS. *Hepialus humuli* (L.), *Hepialus fusconebulosa* (De Geer) (Lepidoptera: Hepialidae). This species evidently uses as hosts larvae living at the base of dense herbage such as grass tussocks. This correlates with the sturdy build and shortened appendages of the parasite which will enable it the better to push its way into suitable host-habitats.

REMARKS. *M. micropterus* bears a superficial resemblance to *abdominator* and to *consimilis*. They all are dark, heavily sculptured insects with short dark wings and short thick legs and antennae. Both *abdominator* and *consimilis*, however, have dorsal pits in tergite one, the ventral borders of which are widely separated, in addition *consimilis* has larger ocelli, strongly twisted mandibles and a long malar space, and *abdominator* a down-curved ovipositor and a broad reticulate-rugose sternaulus.

Meteorus nixonii sp. n.

(Figs 8, 12)

♀. Antennae 43-segmented, long, all segments at least longer than broad. Head broad, contracted behind eyes but not strongly so; temples shorter than eyes. Ocelli small, $OO=2.5$ times OD . Eyes small, protuberant, very slightly convergent. Malar space slightly shorter than basal breadth of mandible. Face about twice as broad as high, not strongly protuberant, centrally reticulate-rugose, laterally reticulate-punctate. Clypeus broad, only slightly narrower than face, not strongly protuberant but deeply impressed at the junction with face and with a strongly reflexed apical margin, shining, sparsely punctured; clypeal hair conspicuously longer than facial hair. Tentorial pits deep. Mandibles large, not twisted, with conspicuous reticulate-foveolate sculpture on basal half. Pronotum strongly rugose. Mesonotum rather narrow, densely almost reticulately punctate, especially on the central lobe; notaulices thin, deeply impressed. Sternaulus reticulate-rugose; rest of mesopleurae polished, punctate except for a subalar patch of rugosity. Propodeum with basal and medial transverse carinae and a central longitudinal carina, with rugose sculpture between. Tergite one rather broad at base, apically only 2.5 times as broad as at narrowest point, the spiracles distinctly before mid-point; dorsal pits large, deep, behind dorsal pits strongly longitudinally strigose. Tergite two with distinct thyridia and a trace of longitudinal strigose sculpture. Ovipositor long, about 4 times length of tergite one. Legs long; hind coxa shining, punctured but not densely so; hind femur densely reticulate-punctate; hind tibia swollen, though not as broad as femur, and narrow at base; tarsal claws thick, strongly curved and strongly swollen at base, almost with a basal lobe. Wings large infumate.

Colour piceous; mandibles, palps, fore and mid legs testaceous, hind coxa and femur brown, tibia black except at the base which is light yellow, hind tarsi black except at base and apex which are light yellow; malar space and clypeus slightly lighter in colour than rest of head.

♂. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Austria**: Tyrol, Oberau, vii.1938 (*Nixon*) (BMNH).

HOSTS. No reared material examined.

REMARKS. The characteristics of tergite one proclaim the close relationship of *nixonii* with *corax* and *sulcatus*. Although the sculpture on tergite two, which is strongly developed in the two latter species, is largely obsolete in *nixonii*, traces of it are discernible and thyridia are well developed in all three species. The characters given in the key to species serve amply to distinguish the three species.

I name this species after Dr G. E. J. Nixon in appreciation of his contribution to the understanding of Hymenoptera.

Meteorus obfuscatus (Nees von Esenbeck)

(Fig. 22)

Bracon obfuscatus Nees von Esenbeck, 1811: 22. Syntypes, GERMANY (destroyed).*Zele thoracicus* Curtis, 1832: folio 415. Syntypes, GREAT BRITAIN: England, Regent's Park (NMV, Melbourne) [not examined]. [Synonymized by Haliday, 1835: 31.]*Perilitus formosus* Wesmael, 1835: 36. LECTOTYPE ♀, BELGIUM: Liege, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Synonymized by Marshall, 1887: 106.]*Meteorus fodori* Papp, 1973: 3. Holotype ♀, YUGOSLAVIA: Montenegro, Bjela Gora, Grahovo, 1929 (*Fodor*) (HNHM, Budapest) [examined]. **Syn. n.**

Wesmael possessed four specimens of *formosus*. Two specimens presently stand in his collection above this name; both are labelled 'Perilitus formosus mihi' in Wesmael's handwriting. The two specimens are female, are conspecific and agree with Wesmael's description of *formosus*; I have selected the better preserved of them as lectotype.

The holotype of *M. fodori* is rather smaller than the average specimens of *obfuscatus* but is within the limits of variation of that species.

♀. Antennae short, 23- to 29-segmented, the basal segments of the flagellum not more than twice as long as broad, often shorter; the segments in the apical half of the flagellum only as long as broad. Head behind eyes contracted, rounded; temples narrower than breadth of head across eyes, slightly shorter than eyes. Ocelli small, OO=2.5 times OD. Eyes large, protuberant, slightly convergent (Fig. 22). Malar space short, not more than half basal breadth of mandible. Face about 1.5 times as broad as high, not strongly protuberant, reticulate-punctate, often weakly rugose beneath the antennal sockets, rarely almost completely rugose. Clypeus protuberant, distinctly divided from face, slightly narrower than face, polished and with scattered large punctures, sometimes with a slight medial impression in the apical border. Tentorial pits small. Mandibles stout, moderately twisted. Pronotum projecting slightly in front of mesoscutum, laterally smooth or at most weakly rugose. Notaulices narrow, foveolate; rest of mesonotum finely punctate. Sternaulus deeply impressed, foveolate, occasionally with a few rugae or foveae immediately below; rest of mesopleurae smooth, punctured except for a rugose-foveolate area beneath the base of the forewing. Propodeum with carinae distinct, occasionally smooth between but usually with more or less well-developed rugosity. Tergite one stout with distinct dorsal pits; generally somewhat raised medially with a medial longitudinal reticulate-rugose band and striae laterally; occasionally tergite one is completely striate dorsally. Ovipositor twice length of tergite one, slender, usually straight but in some specimens down-curved. Legs long, slender; hind coxa smooth punctate; tarsal claws long, without basal lobe but slightly swollen at base.

Colour brownish black, legs always yellow except occasionally the hind tibia infuscate apically; prothorax usually orange-testaceous and sometimes the antennae, head, mesothorax and gaster except for tergite one also this colour, at least partly.

♂. Same as ♀ except that antennae longer, 29- to 32-segmented, all flagellar segments much longer than broad; temple as long as eye, eyes smaller.

MATERIAL EXAMINED

41 ♀, 27 ♂. France, Germany, Great Britain, Hungary, Sweden, Yugoslavia.

HOSTS. The original material was reared from *Orchesia micans* (Panzer) (Coleoptera: Melandryidae); I have examined specimens reared from this same host in *Polyporus hispidus* and others recorded merely as 'ex *Polyporus*'. I have also examined two specimens 'ex cocoons made in cells of Halomerid beetles' and one specimen recorded as a parasite of ?*Scolytus triarmatus* Eggers (Coleoptera: Scolytidae).

REMARKS. *M. obfuscatus* is similar to *profligator* and to *punctifrons* but the conspicuously short antennae, the larger eyes and ocelli and the shape of the head of *obfuscatus* at once distinguish that species.

Meteorus obsoletus (Wesmael)

(Fig. 42)

Perilitus obsoletus Wesmael, 1835: 49. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined].

Meteorus viridanae Johansson, 1964: 251. Holotype ♀, SWEDEN: Borgholm, 30.vi.1954, ex larva of *Tortrix viridana* (L.), coll. 13–16.vi.1954 (Johansson) (ZI, Lund) [examined]. **Syn. n.**

Wesmael (1835: 50) stated that he possessed two males and a female of this species; three such specimens still stand in his collection over the label 'obsoletus' and each is labelled 'Perilitus obsoletus mihi' in his handwriting. The three specimens are conspecific, are in good condition and agree precisely with Wesmael's description. The female specimen has been labelled lectotype by Fischer though he failed to mention this selection in his redescription of the species (1970a).

♀. Antennae 27- to 30-segmented, long, all segments at least 1.5 times as long as broad. Head rounded behind eyes. Ocelli large, OO = OD (Fig. 42). Eyes not protuberant, moderately convergent. Face moderately convex, punctate or reticulate-punctate, sometimes with a little transverse rugosity close beneath the antennal sockets. Clypeus not strongly protuberant. Tentorial pits small, shallow. Mandibles small, strongly twisted. Notaulices shallow rugose grooves. Sternaulus reticulate-rugose, sometimes obsolete anteriorly; rest of mesopleurae smooth, punctate except for a subalar patch of rugosity. Propodeum evenly rounded with only a weak medial impression posteriorly, irregularly reticulate-rugose. Tergite one slender, finely longitudinally striate dorsally, laterally rather smooth at least at the base, without dorsal pits, ventral borders of tergite joined from base of segment to about mid-point; spiracles slightly behind middle of segment. Ovipositor 2.0–2.5 times length of tergite one, straight, slender with no strong preapical constriction. Hind coxa smooth, punctate without strong rugose sculpture, tarsal claws with strong basal lobe.

Colour brownish black; head, prothorax and legs testaceous, mesothorax and gaster also sometimes testaceous; tergite one always dark except occasionally at the base.

♂. Same as ♀ except eyes and ocelli smaller, eyes slightly less convergent and antennal segments slightly longer.

MATERIAL EXAMINED

30 ♀, 21 ♂. **Austria:** 3 ♀, Partschins, Südtirol, 1050 m, 31.viii.1967 (*Haeselbarth*) (EH, Munich). **Belgium:** 2♂, Wesmael coll. (paralectotypes of *Perilitus obsoletus* Wesmael) (IRSNB, Brussels). **France:** 1 ♂, Arles sur Tech, 14.vi.1961 (*Clark*) (BMNH); 3 ♀, 3 ♂, Vaucluse, Mont Ventoux, 1978, ex *Tortrix viridana* (L.) (*du Merle*) (BMNH). **Germany (West):** 8 ♀, 7 ♂, Geierlambach, Heidelbeere, vii–viii.1970 (*Haeselbarth*) (EH, Munich); 1 ♂, 'Oberbiberg bei München, an Heidelbeere', 15.vii.1970 (*Haeselbarth*) (EH, Munich). **Great Britain:** 1 ♀, 1 ♂, England, Gloucestershire, 1932, ex *Tortrix viridana* (L.) (*Brown*) (BMNH); 1 ♀, E., Hertfordshire, Whetstone, 9.vii.1961 (*Ward*) (BMNH); 3 ♀, 4 ♂, E., Berkshire, Wytham (*Varley*) (UM, Oxford); 1 ♀, E., Hampshire, New Forest, 21.vi.1906, ex *Tortrix viridana* (L.) (*Lyle*) (BMNH). **Ireland:** 1 ♂, Co. Sligo, Trawallua, 24–27.vii.1933 (*Nixon*) (BMNH); 27.vii.1933 (*Stelfox*) (USNM, Washington). **Netherlands:** 1 ♂, Waarder (ZH) Oosteinde, 10–11.viii.1971 (*van Achterberg*) (RNH, Leiden). **Sweden:** 3 ♀, Borgholm, 30.vi.1954, ex *Tortrix viridana* (L.) (*Johansson*) (paratypes of *Meteorus viridanae* Johansson) (ZI, Lund); 2 ♀, Röstanga. 4–6.vii.1938 (*Perkins*) (BMNH); 2 ♀, Höör district, 11–13.vii.1938 (*Perkins*) (BMNH). **Turkey:** 1 ♀, 1 ♂, Bulancek, vi.1974, ex *Gypsonoma dealbana* (Frölich) (BMNH).

HOSTS. *Tortrix viridana* (L.), *Gypsonoma dealbana* (Frölich) (Lepidoptera: Tortricidae), larvae feeding on oak between spun leaves or shoots.

REMARKS. This species is superficially similar to *cinctellus* but the closure of tergite one, the larger ocelli and the moderate convergence of the eyes at once distinguish *obsoletus*.

Meteorus oculatus Ruthe

(Figs 5, 6)

Meteorus oculatus Ruthe, 1862: 23. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined].

Meteorus pachypus Schmiedeknecht, 1897: 207. LECTOTYPE ♀, GERMANY: coll. Schmiedeknecht (MNHU, Berlin), here designated [examined]. **Syn. n.**

I have examined three conspecific specimens labelled 'Meteorus pachypus Schmied' in Schmiedeknecht's handwriting (♀♂ MNHU, Berlin, ♀ AU, Wageningen). The two females agree precisely with the description of *pachypus* and I regard them as syntypes of that species. The male sex is not mentioned in the original description and the male specimen is very possibly a subsequent capture and is therefore excluded from consideration as a syntype. The specimen in Wageningen is

part of the collection of van Burgst who is known to have bought material from Schmiedeknecht, probably around 1910–1915 (Zwart, *in litt.*).

♀. Antennae 30- to 33-segmented, rather slender, in apical half of flagellum segments only slightly longer than broad. Head broad, strongly contracted behind eyes; eye about 3 times length of temple in dorsal view. Ocelli small, OO about 2.5 times OD. Eyes very large, protuberant, strongly convergent. Malar space very short, much less than half the basal breadth of a mandible. Face about as broad as high, weakly convex, densely punctate with some rugosity medially. Clypeus not strongly protuberant, smooth with scattered punctures. Tentorial pits large. Mandibles slightly twisted. Prothorax stout, expanded forwards and sideways, rather smooth laterally but weakly rugose in part. Mesothorax rather small, its breadth across the tegulae distinctly less than breadth of head; notaulices deep, foveolate. Sternaulus deep, reticulate-rugose; rest of mesopleurae smooth, punctate except dorsally rugose-foveolate. Propodeum rather narrow, strongly rugose with indistinct carinae, the medial transverse carina, at the junction of the dorsal and posterior faces of the propodeum, the most distinct. Tergite one long, slender; dorsal pits small but distinct, dorsal surface of tergite longitudinally striate with a scalariform element medially. Ovipositor long, about 3 times length of tergite one, straight. Outer face of hind coxa reticulate-punctate; hind tibia strongly swollen, about as thick as femur, constricted at base. Tarsal claws simple, short, thick and strongly expanded at base.

Colour black, legs testaceous; antennae, clypeus, mandibles, pronotum ventrally and tergite two also sometimes lighter in colour; wings infumate.

♂. Same as ♀ except that eyes are less strongly convergent and hind tibia not strongly swollen.

MATERIAL EXAMINED

7 ♀, 1 ♂. **Germany (West):** 1 ♀, Ruthe coll. (BMNH); 1 ♀, 'Oberberg b, München, an Heidelbeere', 2.vii.1969 (*Haeselbarth*) (EH, Munich); 1 ♀, Geierlambach, Heidelbeere (*Haeselbarth*) (EH, Munich); 1 ♀, coll. Schmiedeknecht (AU, Wageningen) (paralectotype of *Meteorus pachypus* Schmiedeknecht); 1 ♂, coll. Schmiedeknecht (MNHU, Berlin). **Hungary:** 1 ♀, Budapest, 1926 (*Biro*) (HNHM, Budapest). **Sweden:** 1 ♀, SM. Alem, Strömsrum, 1958 (*Sundholm*) (ZI, Lund); 1 ♀, Sö., Dalarö Malmen, viii.1976 (*Quinlan & Huddleston*) (BMNH).

HOSTS. No reared material examined.

REMARKS. *M. oculatus* is superficially similar to *graciliventris*, both having very large, convergent eyes, short temples and long ovipositors. *M. graciliventris*, however, has much larger ocelli, small but distinct lobes on the tarsal claws, and temples which are shorter and more strongly contracted than those of *oculatus*; in addition *oculatus* has a strongly swollen hind tibia which is lacking in *graciliventris*.

Meteorus pallipes (Wesmael)

(Figs 50, 51)

Perilitus pallipes Wesmael, 1835: 29. LECTOTYPE ♀, BELGIUM: coll. Wesmael (IRSNB, Brussels), here designated [examined].

Meteorus nigratarsis Ruthe, 1862: 21. Holotype ♀, GERMANY: Ruthe coll. (BMNH) [examined]. **Syn. n.**

Wesmael (1835: 30) stated that he had four males and three females of *pallipes*. There are presently eight specimens in Wesmael's collection labelled 'Perilitus pallipes mihi' in Wesmael's handwriting. Four of these specimens are males of *M. filator* and there is a badly damaged male specimen which is probably also *filator*; these cannot have been part of the syntype-series. There remains a female and two males which agree well with Wesmael's description of *pallipes* and I have designated these lectotype and paralectotypes respectively.

Ruthe possessed only a single specimen of *nigratarsis*. Ruthe himself noted its similarity to *pallipes* and the holotype bears a label 'P. nigratarsis m. pallip. Wsm. var?' in Ruthe's handwriting. Thomson (1895: 2152) placed *nigratarsis* in synonymy with *pallipes*, in my opinion correctly. Schmiedeknecht (1897: 184), however, keyed the two species separately, remarking that they appear to be related and referring to Thomson's action in suppressing *nigratarsis*.

♀. Antennae 26- to 31-segmented, all flagellar segments at least slightly longer than broad. Head strongly rounded behind eyes (Fig. 51). Ocelli large, OO = 2 times OD. Eyes strongly convergent. Malar space short, about half basal breadth of mandible. Face not strongly protuberant but generally with a slightly raised

medial longitudinal area; smooth, punctate. Tentorial pits deep. Mandibles stout, moderately twisted. Pronotum laterally smooth, punctate, with but few rugae. Notaulices thin, foveolate; rest of mesonotum smooth, minutely punctured. Sternaulus foveolate, occasionally anteriorly with a small reticulate-foveolate area beneath, often obsolescent posteriorly; rest of mesopleuron smooth with minute punctures. Propodeum rugose, the carinae often indistinct except for the medial transverse carina which is always strongly developed. Tergite one stout with distinct dorsal pits and glymmae; dorsally generally strongly longitudinally striate, occasionally reticulate medially. Ovipositor 2.5–3.0 times length of tergite one. Hind coxa smooth, punctate; tarsal claws with distinct basal lobe.

Colour black, legs always yellow; head often yellow, at least in part, and gaster occasionally marked with yellow.

♂. Same as ♀ except antennae longer, eyes not strongly convergent.

MATERIAL EXAMINED

38 ♀. **Great Britain, Ireland, Netherlands, Sweden.**

HOSTS. No reared material examined.

REMARKS. Morphologically *pallipes* and *ictericus* are closely similar; the main points of distinction between them are to be found in the shape of the head and in the convergence of the eyes. Indeed, it is doubtful whether headless specimens of the two species could be distinguished. *M. pallipes* is a conspicuously smooth species; the face, the pronotum, the mesopleuron and the hind coxa all lack strong sculpture; the sculpture of the sternaulus is sometimes obsolescent and occasionally obsolete.

Meteorus profligator (Haliday)

(Fig. 24)

Perilitus (Meteorus) profligator Haliday, 1835: 33. Syntypes ♀, IRELAND (lost).

My interpretation of this species is based on material from A. W. Stelfox's comprehensive collection of Irish insects. The specimens named as *profligator* by Stelfox agree precisely with the description given by Haliday and I have no doubt that Stelfox's interpretation of the species is the correct one. Marshall (1887) appears to have had a different interpretation of *profligator* but the only specimen I have seen so named by Marshall agrees neither with Haliday's description nor with Marshall's statements on the species.

♀. Antennae 20- to 22-segmented, all segments of flagellum at least slightly longer than broad. Head rounded behind eyes, temple about equal in length to eye viewed dorsally. Ocelli small, OO = 3 times OD. Eyes small, not strongly protuberant, slightly convergent. Malar space slightly shorter than basal breadth of mandible. Face 1.5–2.0 times as broad as high, smooth, punctate, not strongly protuberant. Clypeus narrower than face, almost flat, its apical border weakly notched medially and usually with a weak vertical impression behind the notch. Tentorial pits distinct. Mandibles short, stout and moderately twisted. Prothorax not strongly projecting in front of the mesonotum, laterally rather smooth with only scattered weak rugae and a few large punctures. Mesothorax short, notaulices thin, foveolate. Sternaulus foveolate, sometimes rather broadened in its anterior half, becoming reticulate-foveolate. Mesopleuron reticulate-rugose dorsally, otherwise smooth, punctate. Propodeum with weak carinae between which there is weak rugose sculpture. Tergite one with large distinct dorsal pits, dorsal surface generally reticulate-rugose with a few longitudinal striae laterally. Ovipositor about twice length of tergite one, slender. Legs slender; hind coxa never strongly rugose but often with a trace of obsolescent rugosity at the base and on the outer surface. Tarsal claws not lobed but somewhat swollen basally.

Colour piceous; antennae in basal half, clypeus, mandibles and usually tergite two reddish testaceous; tegulae and legs yellow.

♂. No material examined.

MATERIAL EXAMINED

30 ♀. **Austria:** 1 ♀, Südtirol, Patschins, 750 m, 1.ix.1967 (*Haeselbarth*) (EH, Munich). **Great Britain:** 3 ♀, England, Northamptonshire, Spratton, ix.1975 (*Gauld*) (BMNH); 1 ♀, E., Kent, Bexley, 16.v.1937 (*Ford*) (BMNH); 1 ♀, E., Devon, Torquay, viii.1929 (*Nixon*) (BMNH). **Ireland:** 1 ♀, Co. Wicklow, Cloughlaague, 2.ix.1953 (*Stelfox*) (USNM, Washington); 1 ♀, Co. Wi., Deputy's Pass, 4.ix.1932 (*Stelfox*) (USNM, Washington); 1 ♀, Co. Kildare, Royal Canal, 10.ix.1944 (*Stelfox*) (USNM, Washington); 1 ♀, Co. Dublin,

Glendhu, viii.1933, em. 24.iii.1934, ex *Cis boleti* (Scopoli) (*Stelfox*) (USNM, Washington). **Netherlands:** 19 ♀, ZH, Waarder, Oosteinde (6 ♀, viii.1973; 1 ♀, vi.1973; 6 ♀, viii.1974; 5 ♀, viii.1975; 1 ♀, ix.1975) (*van Achterberg*) (RNH, Leiden); 1 ♀, Wijster (Dr.), 27.vii.–9.viii.1973 (*van Achterberg*) (RNH, Leiden).

HOST. *Cis boleti* (Scopoli) (Coleoptera: Cisidae); this species of *Meteorus* is evidently parasitic upon the larvae of fungivorous Coleoptera.

Meteorus pulchricornis (Wesmael)

(Fig. 36)

Perilitus pulchricornis Wesmael, 1835: 42. Lectotype ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), designated by Marsh (1979) [examined].

Meteorus striatus Thomson, 1895: 2157. LECTOTYPE ♀, SWEDEN: Skåne, Palsjö (ZI, Lund), here designated [examined]. **Syn. n.**

Meteorus thomsoni Marshall, 1899: 301. [Unnecessary replacement name for *pulchricornis* Wesmael sensu Thomson.]

Meteorus japonicus Ashmead, 1906: 190. Lectotype ♀, JAPAN: Gifu, viii.1902 (USNM, Washington), designated and synonymized by Marsh (1979) [not examined].

Meteorus nipponensis Viereck, 1912: 624. Holotype ♀, JAPAN (USNM, Washington) [not examined]. [Synonymized with *japonicus* by Watanabe, 1939.]

Meteorus macedonicus Fischer, 1957a: 104. Holotype ♀, YUGOSLAVIA: Macedonia, Treskaslucht (NHM, Vienna) [examined]. **Syn. n.**

Meteorus graeffei Fischer, 1957a: 107. Holotype ♂, ITALY: 'Triest' (NHM, Vienna) [not examined]. [Synonymized with *macedonicus* by Fischer, 1970b: 287.]

Meteorus tuberculifer Fischer, 1957a: 108. Holotype ♀, ITALY: Trieste Küstenland, coll. Graeffe (NHM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 43) stated that he possessed one female and three males of *pulchricornis*; four such specimens presently stand in Wesmael's collection above this name. All are conspecific and agree well with Wesmael's description of *pulchricornis* and each bears a label 'Perilitus pulchricornis mihi' in Wesmael's handwriting. Marsh (1979) has selected the female specimen as lectotype. In Thomson's collection six conspecific specimens stand above the name *striatus*; they agree well with Thomson's description of that species. Unfortunately the lectotype, the only specimen from the type-locality, is headless. Marshall (1899: 301) evidently mistook Thomson's concept of *pulchricornis* and proposed for it a replacement name. In Thomson's collection, however, there are seven conspecific specimens standing above the name *pulchricornis* which agree with Thomson's description of the species and which are certainly conspecific with Wesmael's series of *pulchricornis*. The aciculate sculpture on tergite two in *macedonicus* led Fischer to postulate a relationship between this species, *corax* and *sulcatus*. *M. macedonicus*, however, shares none of the other characteristics which distinguish both *corax* and *sulcatus* and I do not believe *macedonicus* to be at all closely related to these species. Furthermore I have seen a few specimens of *gyrator* and *versicolor* which have aciculate sculpture on tergite two to a greater or lesser extent. I therefore regard this as a fortuitous sculptural aberration of no taxonomic significance. Mason (1974: 240) reached a similar conclusion with regard to *Eubazus* Nees von Esenbeck. When the aciculation of tergite two of *macedonicus* is disregarded the species falls well within the limits of variation of *pulchricornis*. *M. tuberculifer* is distinguished chiefly by the possession of large spiracular tubercles upon tergite one. Such tubercles, however, occur occasionally in several species of *Meteorus* and are developed to a lesser extent in other specimens of those species. The possession of prominent spiracular tubercles therefore appears to me to be fortuitous and of no value as a taxonomic character. Apart from the tubercles, *tuberculifer* is structurally indistinguishable from typical specimens of *pulchricornis*.

M. pulchricornis was synonymized with *gyrator* by Fischer (1970b: 263) but the two species are abundantly distinct and neither Tobias (1976) nor Marsh (1979) has accepted this synonymy.

♀. Antennae 29- to 33-segmented, long, slender; all flagellar segments distinctly longer than broad. Head contracted behind eyes (Fig. 36), length of eye about twice length of temple in dorsal view. Ocelli large, OO=1.5 times OD. Eyes large, protuberant, moderately convergent. Malar space slightly shorter than

basal breadth of mandible. Face not strongly protuberant but slightly raised medially, the raised area finely transversely rugose, rest of face smooth, punctate. Clypeus strongly protuberant, evenly convex, finely and densely rugose-punctate with a dense pile of erect hairs. Mandibles small, delicate and strongly twisted. Pronotum laterally rugose. Notaulices foveolate, broadened and rugose anteriorly, coalescing posteriorly into a reticulate-rugose area. Sternaulus rugose, often becoming reticulate-rugose anteriorly but never broadened. Rest of mesopleuron polished, punctate except dorsally where it is reticulate-rugose. Propodeum strongly reticulate-rugose, without distinct carinae. Tergite one longitudinally striate, usually with no dorsal pits but with indications of pits in the sculpture of the tergite; in these specimens the ventral borders of the tergite are in contact for a short distance in the mid part of the segment. Tergite one smooth laterally, sometimes with a few rugae but never with glymmae. Ovipositor 1.5–2.0 times length of tergite one. Legs long, slender; hind coxa generally completely rugose, this sculpture always fine, never reticulate though sometimes transverse. Tarsal claws with a strong basal lobe.

Colour yellow except for the notaulices, the sternauli, the subalar area of the mesopleurae, the propodeum and tergite one which are reddish brown; the tip of the gaster is often darkened and sometimes the preceding tergites. Completely pale specimens occasionally occur.

♂. Same as ♀ except antennae slightly longer; face occasionally strongly raised medially; propodeum smaller, more depressed and with greater variation in sculpture.

MATERIAL EXAMINED

96 ♀, 85 ♂. Cyprus, France, Germany, Great Britain, Hungary, Ireland, Japan, Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, Turkey.

HOSTS. *Lycophotia porphyrea* (Denis & Schiffermüller), *Eupsilia transversa* (Hufnagel) (Lepidoptera: Noctuidae); *Lymantria dispar* (L.) (Lepidoptera: Lymantriidae); *Operophtera brumata* (L.), *Agriopsis leucophaearia* (Denis & Schiffermüller), *Agriopsis aurantiaria* (Hübner), *Eupithecia nanata* (Hübner) (Lepidoptera: Geometridae); *Thecla betulae* (L.) (Lepidoptera: Lycaenidae); *Nola cuculatella* (L.) (Lepidoptera: Nolidae); *Poecilocampa populi* (L.) (Lepidoptera: Lasiocampidae); *Charaxes jasius jasius* L. (Lepidoptera: Nymphalidae).

Many other hosts of *M. pulchricornis* have been recorded in the literature, some of them of considerable economic importance (see Marsh, 1979). The species is evidently catholic in its choice of hosts, attacking caterpillars of species from diverse groups of Lepidoptera.

REMARKS. The densely punctate clypeus with its dense erect vestiture of hairs make *pulchricornis* a distinctive species which is likely to be confused only with *abscissus*. The differentiation of the two species is discussed under *abscissus*.

Meteorus punctifrons Thomson

(Fig. 23)

Meteorus punctifrons Thomson, 1895: 2166. Holotype ♀, SWEDEN: Åreskutan i Jemtland (ZI, Lund) [examined].

There is one specimen under this name in Thomson's collection; it bears a locality label "Åre." (= Åreskutan, the type-locality) in Thomson's handwriting. Thomson stated that he had one specimen and the specimen labelled *punctifrons* agrees well with the description of that species and may therefore be regarded as the holotype. The specimen is in rather poor condition, the abdomen and forewings have become detached, the abdomen has been glued onto the locality label and one forewing on a small piece of celluloid attached to the pin, the second forewing is missing.

♀. Antennae 26- to 27-segmented. Head subcubic. Ocelli very small OO=4 times OD. Eyes small, only slightly convergent. Face about twice as broad as high; frons with a short groove in front of fore ocellus and between ocelli and eye with a patch of large punctures separated at most by a distance equal to their diameter. Mandible stout, slightly twisted. Pronotum very finely reticulate-rugose ventrally. Mesonotum with scattered large punctures, notaulices strongly impressed, foveolate; sternaulus foveolate. Propodeum short, depressed, weakly rugose dorsally, becoming reticulate-rugose on the sides with distinct carinae, excavate apically. Tergite one short, wide, with small but distinct dorsal pits and strong dorsolateral carinae, tergite laterally longitudinally striate with a reticulate-rugose element medially. Ovipositor short, about 1.5 times length of tergite one, down-curved. Legs very long, slender; hind coxa only slightly rugose at the base; tarsal claws long, not lobed but slightly swollen at base.

Colour brownish black; base of antennae, legs, apex of tergite one, tergite two and base of tergite three testaceous though in some specimens these parts are dark brown and the hind coxae black.

♂. Same as ♀.

MATERIAL EXAMINED

6 ♀, 3 ♂, **France**: 2 ♂, 3 ♀, Lorris Forest (Loiret), viii.–ix.1978 (*Herard*) (2 ♀, 1 ♂, BMNH; 1 ♀, 1 ♂ USDA, Sèvres). **Sweden**: 1 ♀, Sk. Åhus 18.vii.1958 (*Hedqvist*); 1 ♀, Bl. Sjöarp, 6.viii.1957 (*Ehnström*); 1 ♂, Ög Åndebol Mösstorp 2.v.1956 (*Hedqvist*) (HC, Stockholm); 1 ♀, Vb. Edefors, Harads, ix.1935 (BMNH).

HOST. *Corticeus longulus* (Gyllenhal) (Coleoptera: Tenebrionidae). The larvae of this species of beetle are scavengers in the burrows of Scolytids in conifers. It is probable that they are sometimes also facultative predators on the Scolytid larvae when these are present.

The French specimens examined came from logs of *Pinus sylvestris* which were infested with Scolytidae (Coleoptera).

REMARKS. This is a small, slender species which is rare, at least in collections; it is easily recognized by the characteristic frontal puncturation, the subcubic head and the minute ocelli.

Meteorus rubens (Nees von Esenbeck)

(Fig. 37)

Bracon rubens Nees von Esenbeck, 1811: 22. Syntypes ♀, GERMANY (lost).

Perilitus leviventris Wesmael, 1835: 46. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Synonymized by Fischer, 1970b: 260.]

Meteorus islandicus Ruthe, 1859: 317. Syntypes, ICELAND: Staudinger coll. (NM, Vienna) [examined]. [Synonymized by Roman, 1917: 4.]

Meteorus medianus Ruthe, 1862: 53. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. [Synonymized with *leviventris* by Marshall, 1887: 126.]

Meteorus scutatus Costa, 1884: 172. Holotype ♀, ITALY: Oristano (MZ, Naples) [examined]. **Syn. n.**

Meteorus heteroneurus Thomson, 1895: 2158. Holotype ♀, SWEDEN: Vestergöthland (ZI, Lund) [examined]. [Synonymized by Fischer, 1970b: 260.]

Meteorus szechuanensis Fahringer, 1935: 11. LECTOTYPE ♀, CHINA: No Szechuan (NR, Stockholm), here designated [examined]. **Syn. n.**

Meteorus mesopotamicus Fischer, 1957a: 105. Holotype ♀, IRAQ: Mosul (NM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 47) stated that he possessed two specimens of *leviventris*; in his collection there now stands a single specimen above the name. This specimen, a female, is labelled 'Perilitus leviventris mihi' in Wesmael's handwriting and it agrees perfectly with the description of *leviventris*, I have therefore chosen it as lectotype.

Ruthe (1859: 317) stated that he had before him 6 ♂ and 8 ♀ of *islandicus* collected in Iceland by Staudinger. Six specimens (5 ♂, 1 ♀) presently stand above the name *islandicus* in Staudinger's collection. These specimens are conspecific, they agree with Ruthe's description of *islandicus* and they are within the limits of variation of *rubens*.

There is one specimen standing above the label 'heteroneurus' in Thomson's collection; it agrees precisely with Thomson's description of the species and bears a label 'VG' (= Vestergöthland, the published locality). I therefore regard this specimen as the holotype of *heteroneurus*. It comes well within the limits of variation of *rubens*.

There are two specimens labelled 'szechuanensis n. sp. Type' in Fahringer's handwriting in the collection of the Riksmuseet, Stockholm, each also bearing the published locality data. Both specimens are conspecific, agree with Fahringer's description of the species and are within the limits of variation of *rubens*. I have chosen as lectotype the specimen bearing a small square ticket marked 27'5, the second specimen, labelled 25'5, as paralectotype.

♀. Antennae short, 24- to 28-segmented; the segments in the distal half of the flagellum often only as long as broad but sometimes longer than this. Head behind the eyes straight for a short distance, then strongly contracted. Ocelli large, OO = 1.0–1.5 times OD. Eyes only slightly convergent. Malar space slightly less than basal breadth of mandible. Face a little less than twice as wide as high, protuberant with a medial longitudinal raised area which is finely transversely rugose, in more heavily sculptured specimens the rugosity

extends onto the lateral areas of the face which are normally smooth, punctate. Clypeus protuberant, transverse, medially reticulate-punctate, laterally finely transversely rugose. Tentorial pits large, distinct. Mandibles long, moderately twisted, the upper tooth generally rather long. Pronotum laterally rugose. Mesonotum densely punctate, the punctures large and often forming a reticulate pattern, especially on the central lobe of the mesonotum. Notaulices short, foveolate, broadened anteriorly and posteriorly, coalescing into a reticulate-rugose area. Sternaulus a shallow rugose furrow; rest of mesopleuron smooth, punctate. Propodeum rugose and generally with only a medial longitudinal carina distinct though sometimes, in less heavily sculptured specimens, the basal and medial transverse carinae can be differentiated from the rugae. Tergite one generally smooth at the base and with obsolescent striae distally, occasionally almost completely smooth. Ventral borders of tergite one conjoined in the midpart of the segment; there is some variation in the extent of this conjunction but it never extends to the base of the segment. Ovipositor twice length of tergite one, thick, strongly swollen at the base and strongly narrowed in the apical sixth. Hind coxa smooth, punctate, sometimes with weak rugosity dorsally at the base. Tarsal claws never strongly bent and usually only swollen at the base but sometimes the swollen base is demarcated as a lobe and occasionally this lobe is dentate, particularly on the claws of the forelegs.

Colour varies from completely black to completely yellow with all intermediate stages represented, none of which is completely characteristic of the species.

♂. Same as ♀ except antennae longer, 26- to 30-segmented, all flagellar segments distinctly longer than broad; the propodeum is more depressed, often less strongly rugose and with the carinae more distinct.

MATERIAL EXAMINED

354 ♀, 144 ♂. **Algeria, Bulgaria, Cyprus, Denmark, Egypt, France, Germany, Great Britain, Hungary, Iceland, Ireland, Israel, Japan, Mongolia, 'Palestine', Sweden, Turkey.**

HOSTS. *Agrotis ipsilon* (Hufnagel), *Agrotis exclamationis* (L.), *Mamestra brassicae* (L.), *Spodoptera exigua* (Hübner), *Noctua pronuba* (L.) (Lepidoptera: Noctuidae); *Cynthia cardui* (L.) (Lepidoptera: Nymphalidae); *Idaea muricata* (Hufnagel) (Lepidoptera: Geometridae).

Muesebeck (1923: 32) pointed out that *rubens* [as *vulgaris* (Cresson)] is 'an important parasite of the cutworm type of Noctuid larva'.

REMARKS. *M. rubens* is a common and widespread species. It is known to be at least Holarctic in distribution and it probably also occurs in other zoogeographical regions. *M. rubens* belongs to a group of species (*heliophilus*, *lionotus*, *versicolor*, *pulchricornis*, *gyrator* and *unicolor*) characterized by the possession of relatively short, thick ovipositors which are generally distinctly narrowed shortly before the apex. *M. rubens* is distinguished from the closely related species chiefly by the characteristics of head-shape, claw-shape and length of antennae. The first tergite of *rubens* is generally rather smooth and sometimes completely so, and this is a useful ancillary character for the separation of the species.

Meteorus salicorniae Schmiedeknecht

(Fig. 20)

Meteorus salicorniae Schmiedeknecht, 1897: 189. LECTOTYPE ♀, GERMANY (EAST): Artern (MNHU, Berlin), here designated [examined].

Meteorus ocellatus Watanabe, 1951: 45. Holotype ♀, JAPAN: Kyushu Hikosan, 17.v.1948 (*Yasumatsu*) (EI, Sapporo) [not examined]. **Syn. n.**

I have examined a specimen from the collection of the MNHU, Berlin which bears two labels in Schmiedeknecht's handwriting: 'Artern [the published type-locality] *Meteorus* n. sp./*Meteorus salicorniae* Schmied. ♀'. This specimen agrees well with the description of *salicorniae* and I have no doubt that it is a syntype of that species. I have not been able to examine type-material of *ocellatus*. The description and figures of *ocellatus* clearly show that it is conspecific with *salicorniae*. The slightly longer malar space and the smaller ocellar diameter given for *ocellatus* I consider to be infraspecific variation or artefacts resulting from differing measuring techniques.

♀. Antennae 33- to 35-segmented; flagellum thick at base, strongly tapering to apex, the three basal segments at most twice as long as broad; antenna set in shallow depression in the frons which bears concentric rugae around the antennal base. Head slightly broader than thorax; temples strongly rounded, slightly longer than eye in dorsal view; occiput concave (Fig. 20). Ocelli small, OO=2.5-3.5 times OD. Eyes small, not

convergent, not strongly protuberant. Malar space slightly longer than basal breadth of mandible. Face strongly protuberant, transverse, about twice as broad as high, smooth, minutely punctured. Clypeus protuberant, not as broad as face. Mandibles large, not twisted. Prothorax projecting slightly in front of mesonotum, strongly swollen laterally, largely smooth, punctate. Sternaulus very deep, foveolate, rest of mesopleuron smooth, punctate except for a strongly rugose area beneath base of wing. Propodeum high, rounded, with indistinct carinae, strongly reticulate-rugose. Tergite one strongly expanded apically, with small but distinct dorsal pits, dorsally with a medial longitudinal reticulate-foveolate area and fine longitudinal striae laterally, lateral surface of tergite strongly rugose basally. Ovipositor about 2.5 times length of tergite one, sometimes slightly more; sheaths with erect hairs which are twice as long as a sheath is broad.

Colour. Head, prothorax, gaster and legs reddish testaceous, gaster lighter in shade than the rest, thorax piceous, the mesonotum, scutellum and base of propodeum also sometimes reddish testaceous; antennae black except for the basal two or three segments.

♂. No material examined.

MATERIAL EXAMINED

Bulgaria: 1 ♀, Rhodopi, Sh. poljana 24.vi.1975 (*Zaykov*) (ZC, Plovdiv). **Austria:** 1 ♀, Südtirol, Partschins, 1000 m, FC, 20.vii.1966 (*Haeselbarth*) (EH, Munich). **Hungary:** 1 ♀, Csobanka, Oszaly, 24.vii.1973 (*Papp*) (HNHM, Budapest). **?Yugoslavia:** 1 ♀, Graeffe coll. (BMNH).

HOSTS. No reared material examined.

REMARKS. The shape of the head and of the antennae of this species are most distinctive.

Meteorus sulcatus Szépligeti (Figs 9, 13)

Meteorus sulcatus Szépligeti, 1896: 310. Holotype ♀, YUGOSLAVIA: Croatia, Grehovica, 10.v.1885 [published as 1882] (*Biró*) (HNHM, Budapest) [examined].

Meteorus insignis Muesebeck, 1939: 83. Holotype ♀, GREAT BRITAIN: England, Hertfordshire, Brickett Wood, 17.vi.1936 (*Benson*) (BMNH) [examined]. [Synonymized by Fischer, 1966: 395.]

Meteorus molorchi Fischer, 1966: 391. Holotype ♀, AUSTRIA: 'Österreich, Wien XIII, ob. Tirolergarten, ex *Molorchus umbellatarum*, vi. 1964 (*Holzschuh*)' (NHM, Vienna) [examined]. **Syn. n.**

The types of both *sulcatus* and *insignis* are in an excellent state of preservation and I have no doubt that Fischer's synonymy of the two species is correct. Fischer (1966: 394) differentiated *molorchi* by its lighter coloration, the slighter, longer antennal segments and the position of entry of the recurrent vein into the submarginal cells. I consider these characteristics to have only infraspecific value and I have been unable to find other structural characteristics by which to distinguish *molorchi*.

Muesebeck's (1939) description of *insignis* leaves little to be added.

♀. Antennae 31- to 36-segmented. Head not expanded behind eyes. Clypeus smooth, punctate. Mandibles short, stout, strongly twisted. Propodeum strongly depressed, without a strong transverse medial carina. Tergite two longitudinally striate, with distinct thyridia. Ovipositor 3.0-3.5 times length of tergite one. Tarsal claws without a distinct basal lobe but swollen at the base. Second submarginal cell conspicuously higher distally than wide (Fig. 13).

♂. No material examined.

MATERIAL EXAMINED

9 ♀. **Austria:** 1 ♀, Rohrwald, Ober-Rohrbach, 14.iii.1968 (*Legorsky*) (EH, Munich). **Great Britain:** 3 ♀, England, Hertfordshire, Brickett Wood, 17.vi.1936 (*Benson*) (paratypes of *Meteorus insignis* Muesebeck) (1 BMNH; 2 USNM, Washington); 1 ♀, same data except 8.v.1943 (BMNH). **France:** Aiguines, Var, 12.vi.1953 (*Veyret*) (MNHN, Paris). **?Germany:** 2 ♀, no data except 'Parasit von *Semanotus undatus*' (EH, Munich). **Netherlands:** 1 ♀, Wijster (Dr), 1-14.vii.1972 (*van Achterberg*) (RNH, Leiden).

HOSTS. *Semanotus undatus* (L.), *Molorchus umbellatarum* (von Schreber) (Coleoptera: Cerambycidae).

REMARKS. The characteristics of tergite one show *sulcatus* to be closely related to *corax* which is also parasitic on Cerambycidae. *M. sulcatus* is generally a much smaller species than *corax*, though it exhibits considerable variation in size, a typical feature of parasites of wood-boring beetles.

Meteorus tabidus (Wesmael)

(Fig. 48)

Perilitus tabidus Wesmael, 1835: 32. LECTOTYPE ♂, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined].

Meteorus fascialis Ruthe, 1862: 22. Holotype ♀, GERMANY. Ruthe collection (BMNH) [examined]. [Synonymized by Schmiedeknecht, 1897: 187.]

Meteorus dubius Ruthe, 1862: 27. LECTOTYPE ♀, GERMANY: Ruthe collection (BMNH), here designated [examined]. **Syn. n.**

Meteorus pentheri Fischer, 1970b: 262 [diagnosis in key]. Holotype ♂, YUGOSLAVIA: Stolac (*Penther*) (NHM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 33) stated that he possessed one female and three males of this species. In the Wesmael collection there are one female and two males labelled 'Perilitus tabidus mihi' in Wesmael's handwriting; they are conspecific and all agree with Wesmael's description of *tabidus*. The female specimen is in poor condition, having lost its head and three legs, and I have therefore chosen as lectotype the best preserved of the male specimens. Ruthe did not indicate what material he had of *fascialis*. There is in the collection of the BMNH one damaged specimen from Ruthe's collection labelled 'P. fascialis m.' in Ruthe's handwriting; this specimen has been labelled as type (3C 757). It agrees with the description and I am accepting this specimen as holotype of *Meteorus fascialis*. There is a female syntype from Ruthe's collection in the BMNH labelled 'P. dubius m.' in Ruthe's handwriting; this specimen, which agrees with Ruthe's description of *dubius* and is clearly within the limits of variation of *tabidus*, is designated as lectotype. Fischer (1970b: 258) suppressed *dubius* as a synonym of *Zemiotetes* [*Zeletis*] *caligatus* Haliday. Van Achterberg (in litt.) states that in the MNHU, Berlin there is a female *caligatus* identified as *dubius*. It seems probable that Fischer's misinterpretation of *dubius* was based on this wrongly identified specimen.

♀. Antennae 28- to 31-segmented, thick, the penultimate five or so segments not longer than broad. Head contracted behind eyes, not distinctly rounded, the occiput not distinctly concave. OO=2 times OD. Eyes large, strongly convergent. Malar space short, about half basal breadth of mandible. Face not strongly convex, rugulose-punctate. Clypeus strongly protuberant, abruptly divided from face, polished, sparsely punctate. Tentorial pits wide, deep, very close to orbits. Mandibles at most moderately twisted. Pronotum heavily rugose except for a smooth band along its dorsal border. Notaulices deeply impressed foveolate grooves which coalesce posteriorly into a reticulate-rugose area. Sternaulus broad, reticulate-rugose, rest of mesopleurae smooth except for a dorsal rugose area. Propodeum strongly rugose, sometimes reticulate-rugose, almost always with a distinct basal transverse carina and often with at least an indication of central longitudinal and medial transverse carinae though neither of these is easily distinguished from the rugae. Tergite one long, narrow, with distinct dorsal pits; generally strongly longitudinally striate and often with some scaly-reticulate sculpture medially. Ovipositor long, 2.5-3.0 times length of tergite one, thick. Legs long; hind coxa strongly rugose; tarsal claws with a distinct basal lobe.

Colour black; tergites 2 and 3 and legs testaceous. The face and base of the antennae sometimes lighter. There is always a lighter-coloured spot on each orbit at the level of the ocelli (though in darker specimens this sometimes almost disappears) and sometimes a lighter patch on the genae just behind the eye. The hind legs are sometimes darker; the hind coxae sometimes black. Wings generally slightly embrowned.

♂. Same as ♀ except that antennae longer, 32- to 35-segmented, all segments of flagellum at least twice as long as broad; temples longer, about equal to eyes in dorsal view; the ocelli slightly larger; the eyes not strongly convergent; propodeum depressed, often narrower and much less strongly rugose so that the carinae are more distinct; tergite one narrower, not so expanded apically sometimes almost linear and with a few coarse longitudinal striae dorsally; the colour generally darker (in the darker specimens the light orbital mark on the vertex is often reduced but it is generally still present if only as a trace).

MATERIAL EXAMINED

28 ♀, 40 ♂. Austria, Bulgaria, France, Germany, Great Britain, Ireland, Netherlands, Sweden, Switzerland.

HOSTS. No reared material examined.

REMARKS. *M. tabidus* is very similar to *affinis*. In addition to the characters given for their separation in the key to species, *tabidus* has a more protuberant clypeus, the area of rugosity at the junction of the notaulices smaller and the rugosity coarser, and it is generally a slightly more robust

insect than *affinis*. The male of *tabidus* is exceptionally distinctive; it most resembles *consimilis* in shape of head, sculpture and colouring but is distinguished by the shorter malar space, the frons not depressed and by a generally more slender habitus.

***Meteorus unicolor* (Wesmael)**

Perilitus unicolor Wesmael, 1835: 41. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined].

Saprotychus chinensis Holmgren, 1868: 430. Holotype ♀, CHINA (NR, Stockholm) [examined]. **Syn. n.**

Wesmael (1835: 41) stated that he had two females and a male of this species. Two specimens presently stand in his collection above the label 'unicolor'; they are conspecific and each bears a label 'Perilitus unicolor mihi' in Wesmael's handwriting and both agree precisely with Wesmael's description of the species.

♀. Antennae long, up to 36-segmented; all segments of flagellum distinctly longer than broad, most at least twice as long as broad. Head contracted behind eyes; temples slightly shorter than eyes in dorsal view. Ocelli large, OO=2 times OD. protuberant. Eyes protuberant, slightly convergent. Malar space about equal in length to basal breadth of mandible. Face 1.5–2.0 times as broad as high, not strongly protuberant but distinctly raised medially and there transversely rugose, laterally densely punctate. Clypeus strongly protuberant, densely rugulose-punctate with scattered long hairs. Mandibles long, slender, strongly twisted. Pronotum projecting but little in front of the mesonotum; coarsely rugose laterally. Notaulices foveolate, broadened and reticulate-rugose anteriorly, coalescing posteriorly in a broad densely reticulate-rugose area. Sternaulus broadened, strongly reticulate-rugose; rest of mesopleurae smooth, punctate except for a large rugose area around the subalar prominence; prepectal carina strongly raised. Propodeum broad, shallowly excavate posteriorly; coarsely reticulate-rugose and with no distinct carinae dorsally though there is sometimes a trace of median longitudinal and transverse medial carinae. Tergite one stout with large dorsal pits and distinct glymmae; ventral borders of tergite only narrowly separated at mid point of segment; dorsal surface longitudinally striate. Ovipositor twice length of tergite one, thick, strongly swollen at base, straight. Hind coxa foveolate laterally, often with a few strong rugae dorsally. Tarsal claws with a large basal lobe.

Colour testaceous, base of tergite one paler yellow.

♂. Same as ♀ except for differences in genitalia.

MATERIAL EXAMINED

Belgium: 1 ♂, Brussels, coll. Wesmael (IRSNB, Brussels) (paralectotype of *Perilitus unicolor* Wesmael). **Germany (West):** 1 ♀, Bavaria, Schliersee, 28.vii.1958 (*Townes*) (CNC, Ottawa). **Great Britain:** 1 ♀, Wales, Dyfed 'Pembrokeshire', 2.vii.1973 (*Ford*) (MSC, Reading).

HOST. *Zygaena filipendulae* (L.) (Lepidoptera: Zygaenidae).

REMARKS. I have seen only two specimens of this species apart from the type-material. The only characters I can find for distinguishing *unicolor* and *abscissus* are those given in the key to species and I am by no means confident that these characters would hold good in a longer series of specimens. When more material is available for study it should be possible more certainly to show whether *unicolor* and *abscissus* are but variants of a single species. *M. unicolor* has been traditionally regarded as a testaceous form of *gyrator* and the two species do resemble each other; *unicolor*, however, is a more robust and heavily sculptured insect but whether these differences will prove in the long run to be valid at the specific level is open to question.

***Meteorus versicolor* (Wesmael)**

(Figs 41, 43)

Perilitus versicolor Wesmael, 1835: 43. Lectotype ♀, BELGIUM: Charleroy (IRSNB, Brussels), designated by Marsh (1979) [examined].

Perilitus bimaculatus Wesmael, 1835: 45. Lectotype ♀, BELGIUM: Charleroy (IRSNB, Brussels), designated by Marsh (1979) [examined]. [Synonymized by Muesebeck, 1923: 36.]

Perilitus unicolor Hartig, 1838: 254. LECTOTYPE ♀. GERMANY (ZSBS, Munich), here designated [examined]. [Junior primary homonym of *unicolor* Wesmael 1835: see *hartigi* below.]

- Perilitus brevicornis* Ratzeburg, 1844: 77. Holotype ♀, GERMANY: Ratzeburg collection (IP, Eberswalde) [examined]. [Synonymized by Königsmann, 1964: 654.]
- Perilitus rugator* Ratzeburg 1852: 59. LECTOTYPE ♀, GERMANY: '741/ neust Br./ Peril rugator ant 30 art', Ratzeburg collection (IP, Eberswalde), here designated [examined]. **Syn. n.**
- Meteorus decoloratus* Ruthe, 1862: 48. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. [Synonymized by Muesebeck, 1923: 36.]
- Meteorus camptolomae* Watanabe, 1939: 25. Holotype ♀, JAPAN: 'Okikuba, Tokyo' (EI, Sapporo) [not examined]. **Syn. n.**
- Meteorus ikonomovi* Fischer, 1959: 5. Holotype ♀, YUGOSLAVIA: Dalmatien, Gravosa (NHM, Vienna) [examined]. **Syn. n.**
- Meteorus hartigi* Shenefelt 1969: 69. [Replacement name for *unicolor* Hartig, 1838.] **Syn. n.**

Wesmael (1845: 43) stated only that he had many specimens of *versicolor*; three specimens now stand in Wesmael's collection above that name, all are conspecific and labelled 'Perilitus versicolor mihi' in Wesmael's handwriting. They agree well with the description of *versicolor*. There are two specimens in the collection above the name *bimaculatus*; Marsh has chosen as lectotype the specimen which best fits the description of the species.

Two conspecific female specimens presently stand above the name *unicolor* in Hartig's collection. One of these specimens bears a label 'unicolor n' in Hartig's handwriting and I have chosen this specimen as the lectotype of the species. It comes within the limits of variation of *versicolor*.

The principal character used by Ratzeburg to distinguish *rugator* was the position of entry of the recurrent vein into the cubital (submarginal) cells. I have found this structure to be variable in most species and consequently it is of little use as a taxonomic character. The specimens discussed by Königsmann (1964: 652) agree with the description of *rugator* and are within the limits of variation of *versicolor*.

I have been able to examine only two male paratypes of *camptolomae* (USNM, Washington) but these are clearly within the limits of variation of *versicolor*.

♀. Antennae 29- to 33-segmented; flagellum thick basally, tapering to apex, all segments of flagellum distinctly longer than broad, most more than twice as long as broad. Head broad, more or less strongly contracted behind eyes, eyes in dorsal view 2.5-3.0 times length of temple. Ocelli large, OO=OD, protuberant. Eyes large, protuberant, only slightly convergent. Malar space short, always less than the basal breadth of the mandible. Face about 1.5 times as broad as high, not strongly protuberant but somewhat raised medially; generally with transverse rugose sculpture, at least on the raised medial part, occasionally smooth, punctate. Clypeus protuberant. Mandibles small, delicate, strongly twisted. Pronotum not projecting before the mesonotum, laterally rugose, sometimes reticulate-rugose. Propleurae rugose-punctate. Notaulices shallow, anteriorly broadened and reticulate-rugose, posteriorly coalescing into a broad rugose area; rest of mesonotum punctate, often reticulate-punctate medially. Sternaulus a broad rather shallow furrow weakly rugose and foveolate, generally broader and sometimes reticulate-foveolate medially; often obsolescent anteriorly and posteriorly; rest of mesopleurae polished and with minute punctures; much of the sculpture of the sternaulus is so weak that it is invisible except under the most oblique light. Propodeum short, broad, strongly rugose, often reticulate-rugose with no distinct carinae but with a distinct medial impression posteriorly. Tergite one long, rather slender at the base with no dorsal pits, its ventral borders conjoined from shortly before the midpoint of the segment to its base, dorsal surface finely striate, lateral and ventral conjoined parts smooth. Ovipositor short, 1.5-2.0 times length of tergite one, thick, strongly tapered shortly before apex. Legs stout, hind coxa smooth, punctate, sometimes reticulate-punctate, often with weak transverse rugae dorsally; tarsal claws strongly curved with a pronounced basal lobe.

Colour varies from almost completely testaceous to almost completely brown; specimens occur fairly commonly in which the propodeum, tergite one except at base, hind coxa, thorax in part and head in part are black, the rest of the body and legs testaceous; sometimes the normally testaceous parts of the body are much paler yellow, almost ivory. The base of tergite one generally pale yellow.

♂. Same as ♀ except that eyes generally smaller and less protuberant. I have examined one male specimen which is completely brownish black.

MATERIAL EXAMINED

152 ♀, 108 ♂. Austria, Bulgaria, France, Germany, Great Britain, Hungary, Ireland, Japan, Mongolia, Netherlands, 'Palestine,' Poland, Sweden.

HOSTS. *Lasiocampa quercus* (L.), *Malacosoma neustria* (L.), *Dendrolimus pini* (L.), *Macrothylacia rubi* (L.) (Lepidoptera: Lasiocampidae); *Leucoma salicis* (L.), *Euproctis chrysorrhoea* (L.), *Dasychira pudibunda* (L.) (Lepidoptera: Lymantriidae); *Anarta myrtilli* (L.), *Lycophotia porphyrea* (Denis & Schiffermüller) (Lepidoptera: Noctuidae); *Eulithis testata* (L.) (Lepidoptera: Geometridae); *Maniola jurtina* (L.) (Lepidoptera: Satyridae); *Thaumetopoea processionea* (L.) (Lepidoptera: Thaumetopoeidae).

REMARKS. Traditionally the principal character used for the separation of *versicolor* from other species of *Meteorus* has been the presence of a pale yellow area at the base of the petiole (tergite one), which strongly contrasts with the rest of the tergite which is darker. Indeed the presence of a pale yellow band at the base of tergite one is an easy and sure way to recognize *versicolor*. In about a quarter of the specimens of *versicolor* which I have examined, however, the yellow colour at the base of tergite one is either absent or is so faint as to be indistinguishable from the condition of tergite one in several other species in which this area is sometimes slightly lighter in colour (e.g. *unicolor*, *obsoletus*). *M. versicolor* is structurally very close to *obsoletus*; in addition to the characters given in the key to species the pale base of tergite one is a useful means of differentiating *versicolor*, also *obsoletus* is generally a much smaller and less robust insect than *versicolor*. *M. versicolor* and, in particular, the testaceous form of this species bears a superficial resemblance to several other species of *Meteorus* (e.g. *lionotus*, *heliophilus*, *gyrator*), being similar in stature, length and shape of ovipositor, colour and sculpture. The ventral closure of tergite one, however, amply distinguishes *versicolor*.

Meteorus vexator (Haliday)

(Fig. 4)

Perilitus (Meteorus) vexator Haliday, 1835: 33. Neotype ♀, IRELAND: Co. Kd., R. Canal, (2), 11.vii.1943 (Stelfox) (USNM, Washington), designated by Fischer (1959: 12) [examined].

Fischer chose as neotype a specimen from Stelfox's collection which had been named as *vexator* by Stelfox. This specimen agrees with Haliday's exiguous description except that it has 23 antennal segments whereas Haliday gave 19–20 as the range; 20 is the least number of antennal segments I have found in the material I have examined of this species. Some workers have been misled as to the significance of the bracketed figure which appears on some of Stelfox's data labels ((2) in the type data for *vexator*). Graham (pers. comm.) states that this figure refers to the number of the collection made on the date with which it appears. Thus the neotype of *vexator* was captured in the second collection which Stelfox made on 11.vii.1943.

♀. Antennae 20- to 24-segmented, slender, all flagellar segments distinctly longer than broad. Head large, much broader than thorax, rounded behind eyes and also more or less strongly contracted; eyes in dorsal view at most twice length of temple. Ocelli small, $OO = 2.5-3.0$ times OD . Eyes large, protuberant, very strongly convergent. Malar space short, much less than basal breadth of mandible. Face small, about as broad as high, not protuberant, smooth, punctate. Clypeus moderately protuberant, smooth, punctate. Tentorial pits distinct and very close to margin of eye. Mandibles short, stout, moderately twisted. Pronotum laterally generally with weak rugose sculpture. Notaulices narrow but distinct, foveolate. Sternaulus narrow, foveolate, sometimes with a small punctate patch beneath; rest of mesopleurae polished except for a small reticulate area beneath the base of the forewing. Propodeum small, distinctly carinate, generally rather smooth between the carinae but sometimes weakly rugulose. Tergite one with distinct dorsal pits at about its midpoint or slightly before; dorsal surface strongly rugose with at most a few weak striae laterally, the lateral faces of the tergite strongly rugose. Ovipositor 2.5–3.0 times length of tergite one. Legs long, slender, hind tibia not unusually swollen, narrower than femur; hind coxa generally at least slightly rugose ventro-laterally though sometimes reticulate-punctate; tarsal claws without a basal lobe.

Colour brownish black, legs testaceous; face, clypeus, mandibles, antennae at the base, pronotum ventrally and tergite two sometimes lighter in colour; hind coxa sometimes infuscate in part, occasionally entirely dark.

♂. Same as ♀ except antennae longer, up to 27-segmented; eyes less convergent and sculpture of sternaulus and of hind coxa sometimes obsolete.

MATERIAL EXAMINED

105 ♀. Austria, Great Britain, Ireland, Netherlands, Sweden.

HOST. *Biphyllus lunatus* (Fabricius) (Coleoptera: Biphyllidae).

REMARKS. I have examined a male specimen belonging to the series on which Morley (1912) based his description of *vexator*. This specimen is certainly conspecific with *vexator* the interpretation of which has been fixed by the designation of a neotype (Fischer, 1959: 12). Morley's association of *vexator* with *Biphyllus lunatus* (Fabricius) is as yet the only indication of a probable host of the species though I consider the evidence upon which Morley based his record to be less conclusive than he stated.

Nomina dubia

Meteorus dejeanus (Rondani)

Perilitus dejeanus Rondani, 1874: 131. Type-material not found.

Meteorus delator (Haliday)

Perilitus (Meteorus) delator Haliday, 1835: 33. Type-material not found.

Meteorus dilutus (Ratzeburg)

Perilitus dilutus Ratzeburg 1844: 77. Type-material lost.

Meteorus effeminatus Ruthe

Meteorus effeminatus Ruthe, 1862: 32.

Ruthe stated that he had two male specimens which he referred to as *effeminatus*. I have examined these specimens but I have not been able to reach a conclusion about their placement.

Meteorus flaviceps (Ratzeburg)

Perilitus flaviceps Ratzeburg, 1844: 75. Type-material lost.

Meteorus gracilis (Ratzeburg)

Perilitus gracilis Ratzeburg, 1852: 58. Type-material lost.

Meteorus longicornis (Ratzeburg)

Perilitus longicornis Ratzeburg, 1844: 76. Type-material lost.

Meteorus pallidus (Nees von Esenbeck)

Bracon pallidus Nees von Esenbeck, 1812: 22. Type-material lost.

Fischer (1970b: 258) placed *pallidus* in *Zemiotes* which then had the rank of a subgenus in *Meteorus*. Van Achterberg (1979: 387) has pointed out that Nees stated there were no dorsal pits on tergite one of *pallidus* and that this precludes Fischer's placement of that species. Van Achterberg therefore concludes that *pallidus* belongs in *Meteorus*. I have, however, been unable to identify the species.

Meteorus pendulator (Latreille)

Ichneumon pendulator Latreille, 1799: 138. Type-material lost.

I have unfortunately been unable to interpret *pendulator*. Marshall (1887: 100) followed Haliday (1835: 28) in placing *pendulator* and *ictericus* in synonymy. The series standing above the name *pendulator* in Haliday's collection includes specimens of both *ictericus* and *gyrator*. The description and figure of *pendulator* show it to have a shorter ovipositor and to be lighter in colour than *ictericus*. *M. pendulator* could quite well be conspecific with *gyrator* but the description is not sufficiently precise to preclude other species.

Meteorus rubriceps (Ratzeburg)

Perilitus rubriceps Ratzeburg, 1844: 75. Type-material lost.

Meteorus ruficeps (Nees von Esenbeck)

Perilitus ruficeps Nees von Esenbeck, 1834: 39. Type-material lost.

***Meteorus rufus* (DeGeer)**

Ichneumon rufus DeGeer, 1778: 597. Type-material lost.

There is a label in the DeGeer collection for '*Ichneumon rufus*' but there is no specimen present. There is no pinhole in the cork above the label which indicates that no specimen was present in the collection when it was transferred to its present cabinet in 1845.

***Meteorus stenostigma* Thomson**

Meteorus stenostigma Thomson, 1895: 2153. Type-material lost.

Two specimens stand in Thomson's collection above the name *stenostigma*. Neither of them agrees precisely with Thomson's description and neither is from the type-locality.

***Meteorus wesmaeli* (Boie)**

Perilitus wesmaeli Boie, 1850: 214. Type-material not found.

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References

- Achtelig, M.** 1974. Beschreibung des Männchens von *Meteorus pachypus* Schmiedeknecht (Braconidae: Hymenoptera) ein unbekannter Parasit von *Raphidia xanthostigma* (Raphidioptera). *NachrBl. bayer. Ent.* **23**: 1-5.
- Achterberg, C. van** 1974. A preliminary key to the subfamilies of the Braconidae (Hymenoptera). *Tijdschr. Ent.* **119**: 33-78.
- 1979. A revision of the subfamily Zelinae auct. (Hym., Braconidae). *Tijdschr. Ent.* **122**: 241-479.
- Ashmead, W. H.** 1906. Descriptions of new Hymenoptera from Japan. *Proc. U.S. natn. Mus.* **30**: 169-201.
- Boie, F.** 1850. Entomologische Beiträge. *Stettin. ent. Zig* **11**: 212-216.
- Burgst, S. van** 1919. Braconidae (Hym.) faun nov. spec. aanwezig in de collectie van het Rijk. *Tijdschr. Ent.* **62**: 104-106.
- Capek, M.** 1970. A new classification of the Braconidae (Hymenoptera) based on the cephalic structures of the final instar larva and biological evidence. *Can. Ent.* **102**: 846-875.
- Costa, A.** 1884. Notizie ed osservazioni sulla geofauna Sarda. *Accad. Sci. fis. mat., Napoli* **22**: 171-172.
- Curtis J.** 1832. *British entomology*. **9**: folio 415. London.
- DeGeer, C.** 1778. *Mémoires pour servir à l'histoire des insectes*. **7**: 950 pp. Stockholm.
- Dessart, P.** 1972. A propos de la date de parution d'une monographie de C. Wesmael (Hymenoptera: Braconidae). *Bull. Annl. Soc. r. ent. Belg.* **108**: 272-273.
- Fahringer, J.** 1935. Swedisch-chinesische wissenschaftliche Expedition nach den nordwestlichen Provinzen Chinas, 26 Hymenoptera, 4 Braconidae Kirby. *Ark. Zool.* **27** (A) (12): 1-15.
- Fischer, M.** 1957a. Neue Paläarktische *Meteorus*-Arten (Hym., Braconidae) *Annl. naturh. Mus. Wien* **61**: 104-109.
- 1957b. Zur Kenntnis der Gattung *Meteorus* Hal. (Hymenoptera, Braconidae). *Opusc. zool. Münch.* no. **3**: 1-5.
- 1957c. Beiträge zur Kenntnis der Paläarktischen Braconiden. *Mitt. münch. ent. Ges.* **47**: 1-21.

- 1959a. Zur Kenntnis der Thomson'schen Braconiden-Arten V. (Hymenoptera). *Ent. NachrBl. oest. schw. Ent.* **11** (3): 74–82.
- 1959b. Neue und wenig bekannte Braconiden aus Jugoslawien (Hymenoptera). *Acta Mus. maced. Sci. nat.* **6** (1): 1–25.
- 1966. Gezuchtete Braconiden aus Niederösterreich und aus dem Burgenland (Hymenoptera). *Z. angew. Ent.* **53**: 385–402.
- 1970a. Redeskription von drei *Meteorus*-Arten aus der Sammlung C. Wesmael in Brüssel (Hymenoptera, Braconidae). *NachrBl. bayer. Ent.* **18** : 50–56.
- 1970b. Die *Meteorus*-Arten des Burgenlandes (Hymenoptera, Braconidae, Euphorinae). *Wiss. Arb. Burgenld.* **44**: 254–300.
- Griffiths, G. C. D.** 1964. The Alysiinae (Hym. Braconidae) parasites of the Agromyzidae (Diptera). *Beitr. Ent.* **14**: 823–914.
- Haliday, A. H.** 1835. Essay on parasitic Hymenoptera. *Ent. Mag.* **3**: 20–45.
- Hartig, T.** 1838. Ueber den Raupenfrass im Königl. Charlottenberger Forste unfern Berlin, während des Sommers 1837. *Jber. Fortschr. Forstwiss. forstl. Naturk.* **1**: 246–274.
- Holmgren, A. E.** 1868. Kongliga Svenska Fregatten Eugénies Resa omkring Jorden. *Vetenskapliga lakitagelser Zoologi*; 1 Insecta, Haft 12 Hymenoptera, pp. 391–442.
- Johansson, S.** 1964. A new *Meteorus* species from Sweden (Hymenoptera: Braconidae). *Opusc. Ent.* **29**: 251–253.
- Königsmann, E.** 1964. Braconidae aus den Resten der Ratzeburg-Sammlung (Hymenoptera). *Beitr. Ent.* **14**: 631–661.
- Latreille, P. A.** 1799. Sur une nouvelle espèce d'ichneumon. *Bull. Soc. philomath. Paris* **2**: 138.
- Lyle, G. T.** 1913. Description of a new species of *Meteorus* (Braconidae). *Entomologist* **46**: 244–245.
- 1914. Contributions to our knowledge of British Braconidae no. 1, Meteoridae. *Entomologist* **47**: 73–77.
- Madel, G.** 1963. Beiträge zur Morphologie und Biologie von *Meteorus fragilis* Wesm. (Hym. Braconidae) – ein Endoparasit des Mondvogels *Phalera bucephala* L. (Lep., Notodontidae). *Z. angew. Ent.* **53**: 1–47.
- Marsh, P. M.** 1979. The Braconid (Hymenoptera) parasites of the Gypsy Moth, *Lymantria dispar* (L.) (Lepidoptera: Lymantridae). *Ann. ent. Soc. Am.* **72**: 794–810.
- Marshall, T. A.** 1887. Monograph of British Braconidae, Part II. *Trans. ent. Soc. Lond.* **1887**: 51–131.
- 1891. In André, E., *Spécies des Hyménoptères d'Europe et d'Algérie*. **5**: 635 pp. Beaune (Côte-d'Or).
- 1897–1900. *Ibid.* **5 bis**: 373 pp.
- Mason, W. R. M.** 1973. Recognition of *Zemiotes* (Hymenoptera: Braconidae). *Proc. ent. Soc. Wash.* **75**: 213–215.
- 1974. A generic synopsis of Brachistini (Hymenoptera: Braconidae) and recognition of the name *Charmon* Haliday. *Proc. ent. Soc. Wash.* **76**: 235–246.
- Minamikawa, J.** 1954. On the hymenopterous parasites of the tea-leafrollers found in Japan and Formosa. *Mushi* **26** (8): 35–46.
- Morley, C.** 1908. Notes on British Braconidae VI. Meteoridae. *Entomologist* **41**: 125–129, 148–150.
- 1912. Rediscovery of the braconid *Meteorus vexator* (Hal.), with a description of the male. *Entomologist* **45**: 4–5.
- Muesebeck, C. F. W.** 1923. A revision of the North American species of Ichneumon-flies belonging to the genus *Meteorus* Haliday. *Proc. U.S. natn. Mus.* **63**: 1–44.
- 1936. The genera of parasitic wasps of the braconid subfamily Euphorinae with a review of the Nearctic species. *Misc. Publs U.S. Dep. Agric.* no. 241: 1–37.
- 1939. Five new species of *Meteorus* (Hymenoptera: Braconidae). *Proc. ent. Soc. Wash.* **41**: 83–87.
- 1954. Some braconid parasites of the pink bollworm *Pectinophora gossypiella* (Saunders). *Boll. Lab. Ent. agr. Filippo Silvestri* **33**: 57–68.
- Nees von Esenbeck, C. G.** 1811. Ichneumonides adsciti, in genera et familias divisi. *Mag. Ges. Naturf. fr. Berlin* **5**: 3–37.
- 1834. *Hymenopterorum Ichneumonibus affinium monographiae, genera Europaea et species illustrantes* **1**: 320 pp. Stuttgart, Tübingen, Cotta.
- Nixon, G. E. J.** 1943. A synopsis of the African species of *Meteorus* (Hym., Braconidae). *Bull. ent. Res.* **34**: 53–64.
- Papp, J.** 1973. Contributions to the braconid fauna of Yugoslavia (Hymenoptera, Braconidae) I. *Acta Mus. maced. Sci. nat.* **14** (1): 1–21.
- Ratzeburg, J. T. C.** 1844. *Die Ichneumoniden der Forstinsekten in forstlicher und entomologischer Beziehung* **1**: 224 pp. Berlin.

- 1848. *Die Ichneumoniden der Forstinsekten in forstlicher und entomologischer Beziehung* 2: 238 pp. Berlin.
- 1852. *Die Ichneumoniden der Forstinsekten in forstlicher und entomologischer Beziehung* 3: 272 pp. Berlin.
- Richards, O. W.** 1977. Hymenoptera. Introduction and key to families. 2nd edn. *Handbk Ident. Br. Insects* 6 (1): 100 pp.
- Roman, A.** 1912. Die Ichneumonidentypen C. P. Thunbergs. *Zool. Bidr. Upps.* 1: 229–293.
- 1917. Braconiden aus den Färöern. *Ark. Zool.* 11 (7): 1–10.
- Rondani, C.** 1874. Nuove osservazioni sugli insetti fitofagi e sui loro parassiti. *Boll. Soc. ent. ital.* 6: 130–136.
- Ruthe, J. F.** 1859. Verzeichniss der von Dr Staudinger im Jahre 1856 auf Island gesammelten Hymenopteren. *Stettin. ent. Ztg* 20: 305–322.
- 1862. Deutsche Braconiden. Drittes Stück. *Berl. ent. Z.* 6: 1–58.
- Schmiedeknecht, H. L. O.** 1897. Die Braconiden-Gattung *Meteorus* Hal. *Illte Wschr. Ent.* 2: 150–154, 173–175, 184–190, 204–207, 221–223, 298–302.
- Schönwiese, F.** 1934. Beobachtungen und Versuche anlässlich einer Übervermehrung von *Lophyrus sertifer* Geoffr. (*rufus* Panz.) in Südkärnten in den Jahren 1931–1932. *Z. angew. Ent.* 21: 463–500.
- Shenefelt, R. D.** 1969. Hymenopterorum catalogus (nov. ed.) part 4 Braconidae 1: 1–176, Junk, 'S-Gravenhage.
- Spinola, M.** 1808. Insectorum liguriae species novae an rariores, quas in agro Ligustico nuper detexit, descripsit, et iconibus illustravit (Hymenoptera). 2: 262 pp. Genuae.
- Szépligeti, G. V.** 1896. Beiträge zur Kenntnis der Ungarischen Braconiden. *Természetr. Füz.* 19: 359–386
- Thomson, C. G.** 1895. Bidrag till Braconidernas kännedom. *Opusc. Ent.* 20: 2141–2339.
- Thunberg, C. P.** 1822. Ichneumonidea, insecta Hymenoptera, illustrata. *Mem. Akad. St. Petersburg* 8: 249–281.
- Tobias, V. I.** 1966. Genera groupings and evolution of the subfamily Euphorinae (Hymenoptera: Braconidae) part 2. [In Russian.] *Ent. Obozr.* 45: 612–633.
- 1976. Braconidae of the Caucasus. [In Russian.] *Opred. Faune SSSR.* 110: 1–286.
- Viereck, H. L.** 1912. Contributions to our knowledge of bees and ichneumon-flies, including the descriptions of twenty-one new genera and fifty-seven new species of ichneumon-flies. *Proc. U.S. natn. Mus.* 42: 613–648.
- 1914. Type-species of the genera of ichneumon-flies. *Bull. U.S. natn. Mus.* no. 83: 186 pp.
- Watanabe, C.** 1939a. *Meteorus japonicus* Ashmead, a parasite of the Gypsy Moth *Lymantria dispar* Linné (Hymenoptera: Braconidae). *Insecta matsum.* 13: 63–65.
- 1939b. A new species of *Meteorus* bred from *Camptoloma interiorata* Walker (Hymenoptera: Braconidae). *Insecta matsum.* 14: 25–26.
- 1951. A new species of the genus *Meteorus* Haliday from Japan (Hymenoptera: Braconidae). *Mushi* 22 (6): 45–46.
- Wesmael, C.** 1835. Monographie des Braconides de Belgique. *Nouv. Mém. Acad. R. sci. Bruxelles* 9: 1–252.
- 1838. Monographie des Braconides de Belgique IV. *Nouv. Mém. Acad. R. sci. Bruxelles* 11: 1–166.
- Westwood, J. O.** 1839. *An introduction to the modern classification of insects.* 2: 587 pp. + Synopsis 158 pp. London.

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